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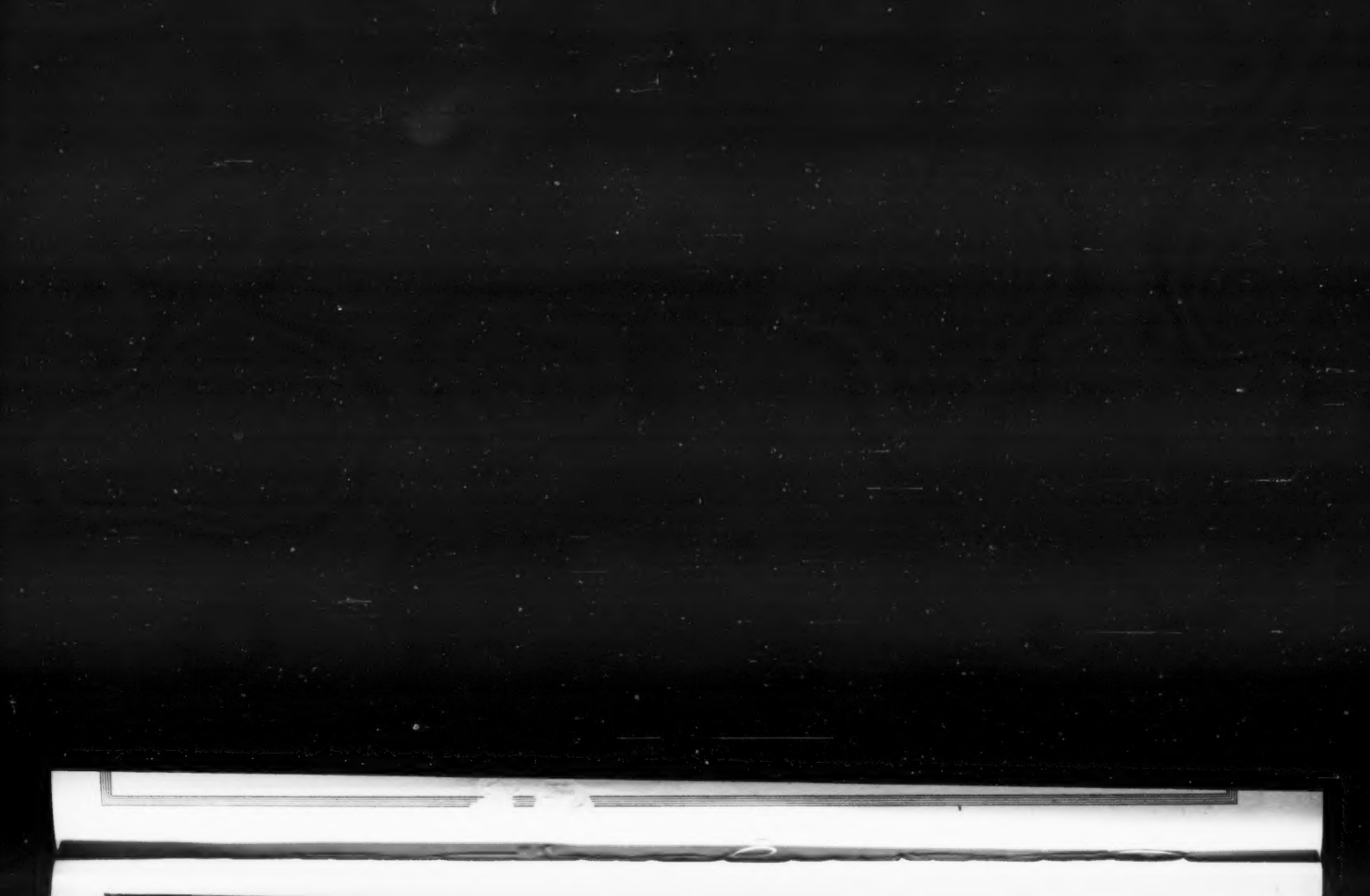

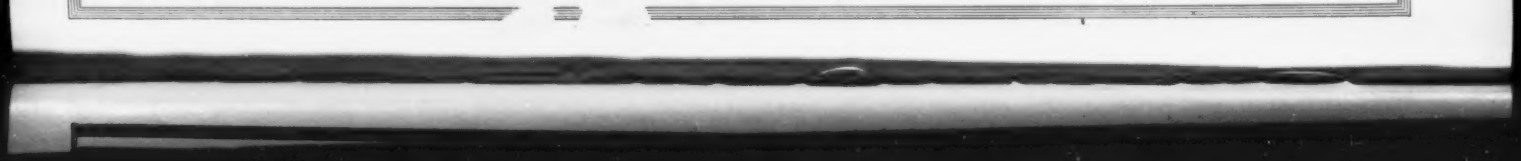

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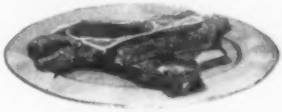

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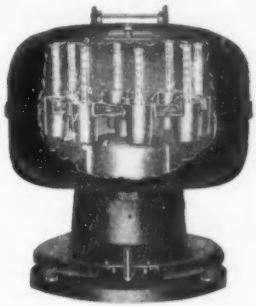

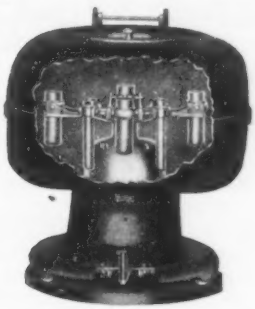

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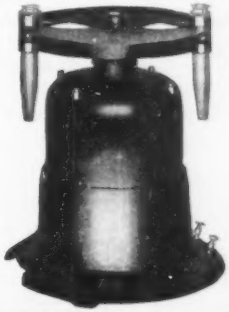

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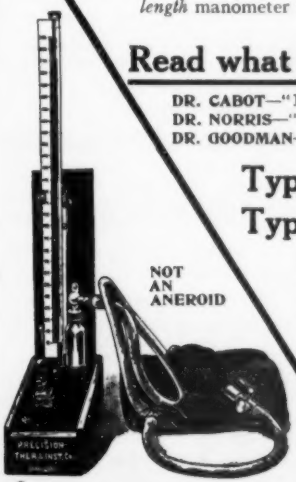

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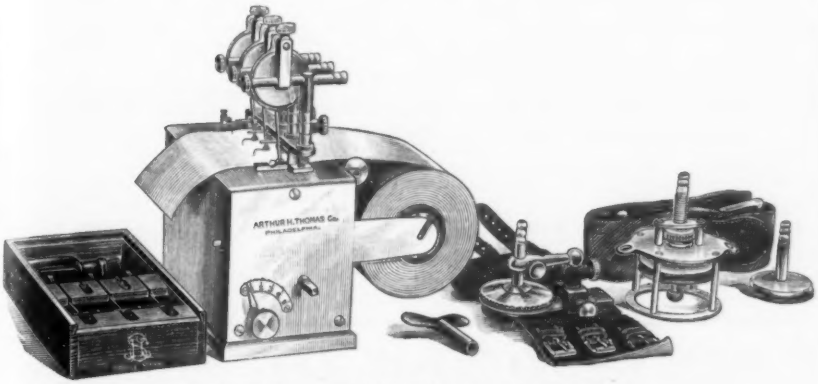

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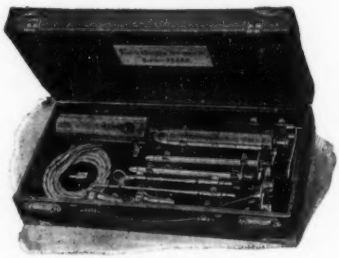

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AMERICAN JOURNAL

OF THE MEDICAL SCIENCES

JANUARY, 1919

ORIGINAL ARTICLES

PERFORATION IN CANCER OF THE STOMACH.[1]

By Julius Friedenwald, M.D.,

PROFESSOR OF GASTRO-ENTEROLOGY,

AND

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While perforation is a complication often noted in the course of gastric ulcer and reports on this condition abound in the literature, there are very few reports of a similar complication in the case of gastric cancer.

Brinton's statistics, which are frequently quoted, show 17 perforations into the peritoneum among 507 cases of cancer of the stomach. In this collection there is one case of gastric fistula due to perforation involving the anterior abdominal wall. In the American edition of Riegel's[2] *Diseases of the Stomach*, edited by Stockton, perforation into the abdomen is classed as a rare termination of cancer of the stomach. W. Hale White, in Allbutt's *System*, gives 4 per cent. as the frequency of the complication. Perry and Shaw[3] made a study of 306 fatal cases of cancer of the stomach collected between 1826 and 1900. There were 13 cases of perforation with acute peritonitis and 7 with localized abscess. Smithies[4] gives 2.5 to 6 per cent. as the frequency of perforation in

[1] Read at the meeting of the American Gastro-enterological Association, Atlantic City, May 6, 1918.

[2] Edited by Stockton, 1903, p. 698.

[3] Guy's Hospital Report, 1904.

[4] Cancer of the Stomach, 1916, p. 101.

gastric cancer. In our series[5] of 1000 cases of cancer of the stomach published in 1914 there were 23 (2.3 per cent.) presenting signs of perforation, but only in 3 of these cases was the perforation demonstrated.

Perforations of the stomach from any cause may be either acute or chronic. In the first-mentioned variety the perforation is accompanied by the urgent symptoms of a spreading peritonitis. With the chronic form there is time for the development of a reaction on the part of the peritoneum, and by organization of the exudated lymph adhesions, bind together adjacent viscera and endothelial surfaces, and so wall off the area of infection which occurs.

The dearth of reports on perforated gastric cancer may be explained by the fact that an acute perforation is not often observed and that the hopeless outlook for cure of the cancer distracts attention from the complication when chronic perforation has occurred.

The spread of gastric cancer from its original situation is by way of the lymphatics. Permeating the lymphatics of the gastric wall the malignant epithelial cells reach the subperitoneal group and stimulate the connective-tissue reaction in their vicinity, with resulting adhesions between the tumor and surrounding viscera or the abdominal wall. The tumor cells then enter the extragastric lymph spaces and metastasis to glands and distant organs occur. The progress of the epithelial cells through the permeated lymphatics is always followed by a fibrosis of the area involved. Willensky and Thalheimer show that the ulceration in cancer of the stomach is certainly associated with if not caused by necrosis, and the digestive action of the gastric juice. The process is a slow one and will allow sufficient time for a considerable development of the adhesive and fibrous reaction just described. This barrier thickens as the ulceration approaches the peritoneal coat and so builds up a resistant wall against the extension of the process. When perforation does occur the opening is made into a protected cavity and a chronic abscess results. As shown by White, in the case of ulcer such perforations may be revealed by roentgen-ray examination. In our experience chronic perforation of cancer of the stomach indicates an inoperable lesion. Four cases, three acute and one of chronic perforation, have come under our observation.

CASE I.—*Acute perforation of carcinoma of the stomach.* On August 3, 1908, Mrs. T. S., aged sixty-two years, sought advice for indigestion which had been annoying her for three months. She had never had indigestion before and dated her gastric disturbance to an upset following a dietary indiscretion in partaking too freely of sausage. Since then her digestion had been poor, notwithstanding the greatest care in her diet. The patient has lost twenty pounds in

[5] Friedenwald: A Clinical Study of One Thousand Cases of Cancer of the Stomach, AM. JOUR. MED. SC., November, 1914.

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flesh and complained of loss of appetite, pressure and abdominal distention, nausea, occasional vomiting and gastric pain not in any way related to food. The vomited material was light in color and far in excess of the last meal partaken.

On physical examination the heart and lungs were found normal. The abdomen was much distended and peristaltic waves could easily be made out. A hard mass was readily palpated, which was situated at about the center of the epigastrium, and which was about 4 cm. long and 6 cm. in breadth. The inguinal glands were markedly enlarged. The test-meal revealed an absence of free HCl; presence of lactic acid and evidence of marked retention. The diagnosis of carcinoma at the pylorus, with obstruction, was made and operation advised.

At the operation a large carcinomatous mass was found involving the pylorus and nearly half of the body of the stomach; on account of mestastases in the mesenteric glands, as well as in the liver, no attempt was made at excision. A gastro-enterostomy was performed. The patient made a satisfactory recovery from the operation and was able to take nourishment better for a time. The emaciation, however, progressed, and after two months, following operation, the patient became melancholic and developed suicidal tendencies, requiring the constant care of a trained attendant. Suddenly, on the morning of December 10, 1908, she was seized with an intense abdominal pain, which was followed by symptoms of intense shock, a rapid pulse, clammy extremities and cold perspiration. Three-quarters of a grain of morphin was required within an hour for the relief of the pain. The patient died within a few hours. A partial autopsy was performed and a large perforation was observed in the midst of the carcinomatous mass at the pylorus. The gastro-enterostomy opening was patent.

CASE II.—*Acute perforation of carcinoma of the stomach.* J. S., aged fifty-seven years, male, consulted us on January 20, 1910, for a digestive upset, with which he had been troubled for six months. He complained of pain in the region of the stomach, nausea, indigestion, weakness and loss of thirty-six pounds of flesh.

He was found to be a very emaciated individual, with a large mass in his abdomen in the region of the stomach. The gastric contents presented an absence of free HCl and contained lactic acid and Oppler-Boas bacilli. The diagnosis of carcinoma was made without question. Two days following the examination the patient was suddenly seized with intense abdominal pain, which lasted several hours and which was only slightly relieved by hypodermic injections of morphin.

The patient died within six hours, and on section an opening sufficiently large to admit a lead-pencil was observed in a carcinomatous mass in the body of the stomach. The abdominal cavity was filled with gastric contents.

CASE III.—*Chronic perforation; fistulous opening through the abdominal wall.* William F., colored, aged fifty-three years, entered the Mercy Hospital on December 6, 1913, and died on December 9, 1913.

The patient has been troubled with indigestion for the past three months; he had nausea and vomiting during this time and suffered from distention and fulness after food. He noted a swelling in the epigastrium; considerable shortness of breath; loss of strength and flesh. The patient had occasional chills, followed by a moderate rise in temperature. There was no history of hematemesis or jaundice, though the stools were frequently tar-colored. There was a history of the use of intoxicants and tobacco to excess.

On physical examination the patient was found to be a very feeble and markedly emaciated negro; the heart and lungs were normal. The abdomen was soft and a definite mass was noticed on the right side just below the costal margin, which was easily palpable, the size of a hen's egg, and which was somewhat nodulated. The inguinal and axillary glands were much enlarged and easily palpable.

Just to the left of the median line and above the umbilicus a scar of an operation was observed, situated at the lower angle of the scar was an ulcerated area, in the center of which was found a fistulous opening, connected with the interior of the stomach through a sinus. Milk taken by the mouth discharges in a curdled state in about an hour after ingestion upon the external abdominal wall. The margin of the sinus was stony hard on palpation. A more careful history could not be obtained, nor could a very satisfactory examination be made on account of the great weakness of the patient. A diagnosis of carcinoma with perforation and fistulous sinus was made. The patient died in three days from exhaustion.

At the autopsy a carcinoma of the pylorus was found with metastases in the liver, kidneys and bronchial glands. The sinus extended from the interior of the stomach through the cancerous mass to the external abdominal wall, where it opened just above and slightly to the left of the umbilicus. The fistulous tract consisted of ulcerated carcinomatous tissue, and through it the gastric contents were discharged.

CASE IV.—*Acute perforation of cancer of the stomach.* G. E. W., white, aged seventy-three years, was admitted to the Mercy Hospital, March 29, 1916, on account of severe abdominal pain. The onset of his symptoms occurred at noon, when his trouble was diagnosed acute indigestion. Morphin given at this time did not relieve the pain. Two hours later he came to the hospital and the great pain, tenderness and rigidity of the abdomen led to an immediate diagnosis of perforative peritonitis. There was no vomiting, but persistent nausea. The general condition of the patient was bad; he was cyanotic, with a rapid pulse and showing every sign of great distress. There was dulness in both flanks. A ruptured cancer of

the stomach was considered the cause of the peritonitis, because of the history of a six months' period of indigestion and a loss of twenty-five pounds in weight during this period. Operation was advised and accepted.

Operation March 29, 1916, 3 P.M. Anesthesia: novocain and ether. Right rectus incision with transverse cut at upper angle; gelatinous fluid in peritoneal cavity. The perforation, about one-sixteenth inch in diameter, was found in a small annular cancer near the pylorus. Apparently the omentum had been loosely adherent to the opening. The opening was burned with the cautery and the area turned in with mattress sutures. The omentum was sutured over this region. Drains were carried to the region of the perforation and the right kidney fossa. The pelvis was drained through a suprapubic wound. The patient rallied from the anesthesia, but died about thirty-six hours after the operation. Postmortem examination was not permitted.

PROGNOSIS IN HEART DISEASE IN RELATION TO AURICULAR FIBRILLATION AND ALTERNATION OF THE PULSE.

By Paul D. White, M.D.,
Boston, Mass.

(From the Medical Clinic of the Massachusetts General Hospital, Boston.)

In the course of an investigation three years ago (1914) on the frequency of alternation of the pulse, interesting groups of cases were accumulated and studied with the polygraph and electrocardiograph. Three series of cardiac patients, comprising 100 each, were collected with relation to the type of pulse and cardiac rhythm shown. The first series was composed of cases with auricular fibrillation, the second of cases with alternation of the pulse and the third of cases with normal cardiac rhythm without alternation. Heart-block, auricular flutter and paroxysmal tachycardia were not included *per se*.

For study as to prognosis the groups of auricular fibrillation and pulsus alternans were subdivided, each into three classes. The patients with auricular fibrillation were subdivided into (*a*) those who showed aberrant ventricular complexes, the so-called "bundle branch block," (*b*) those who showed ectopic ventricular contractions and (*c*) those who had uncomplicated auricular fibrillation. Since some of these 100 cases had not been electrocardiographed they could not all be so grouped. The patients with alternation of the pulse were also subdivided as already reported in an earlier paper[1] into (*a*) those who had constant pulsus alternans, (*b*) those

[1] White, P. D.: Am. Jour. Med. Sc., July, 1915.

having marked alternation after premature contractions only and (*c*) those showing only slight alternation after premature contractions. It was believed that the greater the grade of alternation the worse the prognosis. All of the 100 patients with pulsus alternans had radial pulse tracings taken. The 100 patients with normal rhythm, also studied cardiographically, were not subdivided.

At the present time, just three years after beginning to collect these series of cases and two years after finding the most recent case, I have looked up the patients in order to determine their present condition. The results of this investigation I have tabulated (see Table) and am reporting here briefly for what they are worth. About one-third of the patients have been lost sight of, but the results from the others are of interest and of value.

Condition.	Type.	Total.	Cases followed until present time.	Better.	Unchanged.	Worse.	Dead.	Per cent. dead of cases traced.
Alteration of the pulse	Constant	26	22	2	0	0	20	91.0
	Marked after premature beats	16	12	0	0	0	12	100.0
	Slight after premature beats	58	42	4	13	1	24	57.0
	Total of alternation	100	76	6	13	1	56	74.0
Auricular fibrillation	Cases electrocardiographed	69						
	(1) Aberrant ventricular complexes	5	4	0	0	0	4	100.0
	(2) With ectopic beats	11	7	1	1	0	5	71.0
	(3) Uncomplicated	53	35	2	18	4	11	31.0
	Cases not electrocardiographed	31	16	2	3	1	10	62.5
	Total of auricular fibrillation	100	62	5	22	5	30	48.0
Normal rhythm	No alternation, fibrillation, paroxysmal tachycardia, flutter or heart block	100	49	8	15	3	23	47.0

Discussion. From a glance at the Table it is obvious that in these series pulsus alternans taken *in toto* give a much poorer prognosis than auricular fibrillation, but that auricular fibrillation as such adds little if anything to the gravity of prognosis in a case of heart disease. The higher grades of pulsus alternans are almost twice as grave as the slight degrees, *i. e.*, slight alternation following premature contractions, while between the two severe grades, constant alternation and marked alternation after premature contractions, there is little to choose, the mortality in such grades together being almost 100 per cent. (94 per cent.) within a period of three years. However, even the cases with slight alternation after premature beats have a mortality of over 50 per cent. within

the three years and definitely higher than either the auricular fibrillation or the normal rhythm averages.

In the case of auricular fibrillation I have often wished that I might be able to pick out by graphic methods the more serious cases, as one can do in pulsus alternans, as I have shown above. By examining the Table one sees some clues which help one in this attempt. For this selection electrocardiograms are necessary. Patients who show auricular fibrillation complicated by aberrant ventricular complexes or by ectopic ventricular contractions have a much graver prognosis than the uncomplicated auricular fibrillation, much more than twice as grave, especially in the case of the aberrant ventricular complexes, where in my small group of cases the mortality was 100 per cent. within three years. Such a finding might be expected because the electrocardiograms indicate serious myocardial damage or irritability in the ventricles. Such diseased or hyperirritable ventricular muscle does not stand up under the strain of auricular fibrillation the way relatively healthy ventricular muscle does. It is probable that one may regard these two conditions complicating auricular fibrillation as important as the presence of pulsus alternans in the case of a non-fibrillating heart. In fact, one of the patients tabulated above as having aberrant ventricular complexes and auricular fibrillation combined had been seen by me before his heart became arrhythmic and a radial pulse tracing at that time showed pulsus alternans.

Further confirmation of these findings in larger groups of cases would be of interest. The prognostic value of electrocardiograms as well as of radial pulse tracings is brought out by this investigation, the former especially as regards auricular fibrillation and the latter as regards alternation of the pulse.

SUMMARY. 1. Three groups of 100 patients each, showing (1) pulsus alternans, (2) auricular fibrillation and (3) normal rhythm, have been studied with relation particularly to prognosis. A large number of each group has been followed for two or three years and the condition determined at the end of that time.

2. Seventy-four per cent. of the cases with pulsus alternans, 48 per cent. of the cases with auricular fibrillation and 47 per cent. of the cases with normal rhythm have died.

3. The higher grades of alternation of the pulse carry with them an especially high mortality, nearly 100 per cent. within three years.

4. The cases with auricular fibrillation complicated by aberrant ventricular complexes seem to be very fatal (100 per cent. in the present series), those cases with ectopic ventricular contractions complicating the fibrillation have a mortality almost as high as the total of alternation while uncomplicated auricular fibrillation has a surprisingly low mortality percentage.

I wish to thank all those who have helped me to follow the cases discussed in this paper, especially Miss Catharine Thacher for her painstaking work.

A MODERN ASPECT OF THE TREATMENT OF ULCUS VENTRICULI.

By I. W. Held, M.D.,
and
M. H. Gross, M.D.,
New York.

A. *Prophylaxis.* In the prevention of ulcer of the stomach, universal rules, as in certain contagious diseases, cannot be laid down because no one factor can be held responsible for the occurrence of the ulcer. In this disease prophylaxis begins at a time when the patient presents himself with gastric symptoms, indicating the existence of hypersecretion or hyperacidity, and in some cases predominating motility disturbances. When such symptoms are allowed to persist, ulcer of the stomach may develop.

Our first duty is to determine the etiological factors of his complaint, and from a clinical standpoint the following points must be taken into consideration:

1. Status of the individual.
   (*a*) Sthenic.
   (*b*) Asthenic.
2. Local intra-abdominal diseases, like chronic appendicitis, cholelithiasis, obstipation.
3. Focal infections.

1. *Status.* As to the sthenic type (status apoplecticus) it is not an uncommon experience to have well-preserved, healthy looking individuals (mostly men) complain of pyrosis, and even moderate pains two or three hours after a meal, of fulness relieved by belching. These symptoms are aggravated by hurried eating, especially if quality or quantity of food is disregarded. These people are particularly troubled because previously they had enjoyed unusual privileges on the part of the gastro-intestinal tract. They ate at all hours, gulping down a heavy lunch and hurrying back to perform hard duties of a mental and physical sort. Suddenly they begin to notice that mental and physical rest, moderate observation of diet and restraint in the use of heavy cigars become necessary to their well-being.

Such a symptom-complex may indicate the real pre-ulcerative stage, and it is our duty not to look lightly upon the complaints. The patient must be told that the functions of his stomach have exceeded the point of accommodation to abuses, and from now on his mode of life must be regulated in order to prevent the formation of an ulcer in the stomach. The symptoms are to be controlled by a non-irritating, easily digested diet, allowing only milk, eggs, thin cereals, toast and butter for four or five days, gradually adding

vegetables in purée form, boiled chicken, lamb chops, veal, ham and cooked fruits. His future mode of life must be mapped out.

In our experience such individuals are much benefited by two substantial meals taken at home morning and evening. During the lunch-hour crackers and milk, or tea with milk, or zoölak, not very cold, and zweiback should suffice to satisfy hunger.

The breakfast should consist of orange juice or grapefruit, or baked apples with cream, or stewed peaches with cream, eggs in any form (except hard boiled), cereals, bread and butter, and weak coffee, cocoa, tea or milk.

The evening meal may include the following:

Grapefruit, oysters, vegetable, noodle or barley soup, not spiced, fish plainly cooked or fried in butter.

Meats: Lamb, steak (well done), roast beef, chicken, veal, cooked ham, or white of turkey.

Vegetables: Fresh green vegetables cooked, salads, potatoes, stewed fruit.

Light puddings, cream cheese and Vichy water. We must not allow spicy substances, nor duck, goose, canned goods, coarse vegetables, excess of sweets or ice-cold drinks.

From the hygienic standpoint the patient must be told to eat slowly and at regular intervals, taking a short rest after the evening meal, and to smoke moderately. He should utilize his week-ends for complete relaxation and spend the summer vacation at a spa (Saratoga, etc.).

Asthenic Type. In contradistinction to the type just described, when the ulcer is the outcome of continuous local irritation, there is the asthenic type (habitus Stiller), in which physical inferiority predisposes to ulcer. Here, while fulness and distress after meals and sour eructation are of a frequent and troublesome nature, the more or less indefinite and negligible objective findings outside of the status and hyperacidity cause the physician to look lightly upon the complaint. Overfeeding, with indifference as to quality on the one hand, or extreme care, resulting in still greater loss of weight as well as the existing vagotonia, finally lead to ulcer. This group may also include the chlorotic girl, with tendency to ulcer, partially because of the anemia and probably because of her perversion in the selection of sour, spicy food as well as chalk.

The method of preventive treatment depends on the general condition of the patient. If not very much run down we first restrict fluids, allowing food in semisolid form of a non-irritating character, in smaller quantities and at more frequent intervals. The dietetic regime may be laid out as follows:

Breakfast. Cereals cooked in milk in a double boiler, prepared thick and taken with butter; 1 to 2 eggs, soft boiled or scrambled; toast with butter; 150 gr. of cocoa or milk or tea with milk. At 10 A.M. a cup of warm milk.

Noon. Chopped or minced meats boiled or fried in butter (chicken, pigeons, veal, lamb); fresh green vegetables cooked and in purée form (spinach, carrots, asparagus tips, cauliflower, green peas, string beans, turnips); light pudding, apple-sauce and toast. At 4 P.M. a cup of warm milk.

7 P.M. Same as breakfast, including a baked apple and cream cheese. Before retiring, another cup of warm milk.

For patients who are very much run down a modified Weir Mitchell rest cure should be insisted upon from the start. The modification consists in not using a milk diet exclusively for the four to six weeks of treatment and not an absolute confinement to bed for longer than three or four days. Furthermore, the four to six weeks of treatment should serve as an education to the patient in taking care of his digestive organs in particular and mode of living in general.

During the first three or four days, while in bed, 6 ounces of warm milk and 2 ounces of sweet cream are given every two hours from 8 A.M. to 10 P.M. When there is aversion to the excessive intake of milk we add to the milk at every second or third feeding weak tea or caffein-free coffee. Should there be a tendency to diarrhea, strained barley, rice water or cocoa may be added to the milk.

During these days a cold rub in the morning and a light massage mornings and evenings are very helpful. When bloating or tendency to constipation exists a soapsuds enema before retiring is ordered.

After four days the intervals of feeding are increased to three hours, and to every second meal we add one or two soft-boiled eggs and a thin cereal. This is continued to the end of the week, during which time the patient is allowed to walk intermittently two or three hours in the course of the day. If the symptoms have receded a more liberal diet is allowed, *i. e.*, toast and butter, mashed potatoes and at about the end of the second week the diet outlined for milder cases can be tolerated.

Patients are benefited by wearing well-fitting abdominal binders, which not only raise up the abdominal viscera but assist the tone of the abdominal wall, thereby increasing the tone of the stomach. General hygienic measures, like appropriate hydrotherapeutics and moderate exercise, must constitute an important part of the treatment. A few suggestions as to specific hydrotherapeutics may be in place. When still in a weak and helpless state cool packs, either of the entire body or of three-quarters of the body, are very beneficial, with warmth applied to the feet and cold to the head. The patient remains in the pack for one hour. The method can easily be taught to a member of the patient's family.

A thoroughly wrung-out sheet, in water of a temperature of 70° to 80° F., is spread out on a blanket, the patient is quickly wrapped in the wet sheet from neck to feet, or knees, and over this the flannel blanket is tightly wrapped.

When the patient begins to feel stronger a half-bath is ordered, at a temperature of 95°, decreasing daily until 75° to 80° is reached. He is kept in the bath for from five to ten minutes, constantly rubbing the chest. A cold towel is applied to the head. Before leaving the bath, water of 5° lower than the bath is poured over the spine. The body is quickly dried and the patient is made to rest for at least half an hour. Later on a morning shower, first of tepid and gradually cold temperature, is to be employed. A Priesnitz compress over the abdomen, to be kept overnight, is very beneficial.

The morning hydrotherapeutic measures should be carried out either on an empty stomach or half an hour after a cup of warm milk. As to drugs it is often unnecessary to use any at all. The absence of drugs is often an excellent suggestive therapeutic with an intelligent patient. It makes him feel that the disease is not serious.

When the above treatment alone does not relieve the symptoms of hyperacidity alkalies (magnes. usta and natrii bicarbon., āā 1.0 t. d.) or, if diarrhea is annoying, bismut. subcarbon., 1.0 t. d. is very useful. Because the hyperacidity in these cases is a part of the vagotonia, atropin sulphate, 0.0005, or extr. belladon., 0.02 in the form of suppositories, 2 t. d., should be given.

The nervous symptoms which are often annoying during the first or second week of the treatment, notwithstanding hydrotherapeutic procedure, may call for nerve sedatives. Bromides are usually depressing when given for a greater length of time, and may even aggravate the gastro-intestinal symptoms. Much more useful are the valerian preparations. The objection to most valerianates lies in the taste and odor. The proprietary ones, like borneval, valedol, etc., are very expensive. We found that a cold infusion served the purpose very well. It is made as follows: One teaspoonful of dried valerian roots is put into 8 ounces of hot water and allowed to stand all day. At night it is passed through a piece of gauze and taken cold with sugar. The constipation in these cases should be overcome by diet, going to stool at a regular time and, if necessary, a daily soapsuds or saline enemas.

We have endeavored to outline more or less in detail the methods of treatment in both sthenic and asthenic individuals, the application of which can result in prevention of ulcer formation. From the standpoint of prognosis it is important to point out that a sthenic individual once having shown gastric symptoms must be cautioned against indiscretions in diet for the rest of his life. With the asthenic individual (in whom the local gastric symptoms are more the result of systemic inferiority), if treatment has resulted in considerable gain in weight and a toning up of the system in general and the gastro-intestinal tract in particular the benefit may persist through the rest of his life, without any more dietetic or hygienic restrictions than the average healthy person needs.

The asthenic individual, by virtue of the above treatment, is

transformed into a person who can adapt himself to his duties and external influences, although the inborn stigmata of his habitus persist.

2. *Local Intra-abdominal Diseases.* The etiological relation of chronic appendicitis, and more rarely cholelithiasis to formation of an ulcer in the stomach, was pathologically demonstrated conclusively by Roessle, Lichtenbelt and surgically by Moynihan, Mayo and others. Some observers, among them Rosenow, hold that the mode of production of ulcer secondary to chronic appendicitis or cholelithiasis is that of infection. Roessle, von Bergman and Lichtenbelt, on the other hand, believe that sympathetic nervous irritation causes secretory and motor disturbances in the gastric mucosa, leading to local ischemia, erosion and ulcer formation.

We are of the opinion that an ulcer in the stomach is, as a rule, not the result of infection. Bacterial infection causes inflammatory changes which have different characteristics from those of the ulcer. The round peptic ulcer, with its punched-out appearance and overhanging edges, impresses one definitely that chemical, thermic or traumatic agents are the existing factors, and the primary cause is to be looked for.

In chronic appendicitis as a primary cause the conception of Roessle and Lichtenbelt is the more plausible. The clinical manifestations point to the correctness of such a conception. The local gastric symptoms, even before the ulcer exists, indicate so strongly an ulcer in the stomach that a mistake is often unavoidable.

Such pre-ulcerative symptoms in connection with chronic appendicitis can certainly not be attributed to bacterial infection. Surgical findings in cases of chronic appendicitis, or even gall-bladder trouble where the symptoms point to gastric ulcer, show in the vast number of cases an atrophied, small or obliterated appendix, sometimes containing fecoliths or other foreign bodies.

Extensive adhesions around the appendix or gall-bladder, or both, give rise to a gastric symptom-complex entirely different from ulcer. The pains are of a more continuous nature, with sensation of abdominal distention; gastric or intestinal stagnation as a result of kinks; or an open pylorus with rapid emptying because the adhesions interfere with the normal contractions of the pylorus.

Gall-bladder affections giving rise to gastric symptoms simulating ulcer and finally leading to ulcer formation a'so prove upon removal to be small, contracted and atrophic, with a greatly destroyed mucous membrane.

Chronic functional constipation, causing prolonged gastric hyperacidity, may finally lead to formation of ulcer.

From what has been said it seems to us plausible to assume that gastric disturbance manifesting itself clinically as hyperacidity, if reflex to a disease of intra-abdominal organs (appendix, gall-bladder, colitis or rectal or colonic constipation), the primary seat of the

affection in the organs named is mostly in the mucosa, with atrophic changes of greater or lesser degree. If the organs, on the other hand, show changes in the serosa leading to extensive adhesions the gastric symptoms are those of motility disturbance. The first class gives clinically the symptom-complex closely simulating ulcer, such as periodicity, relation of pain to quality, quantity and time of food taken, digestive hypersecretion and hyperacidity and good appetite. In the second class the gastric symptoms are pressure and distress after meals, sometimes pain, only relieved by vomiting, poor appetite, coated tongue, bad taste and sallow countenance.

The fact that the atrophic diseases of the organs named lead to gastric hyperacidity and ulcer seems to us a further proof that the bacterial invasion cannot be the primary factor in ulcer formation, but the pathological interrelation lies, as pointed out above and described by us elsewhere, in the nervous mechanism.

The foregoing discussion may be of assistance in the prophylaxis of ulcer in the stomach. In cases of hyperacidity, when the clinical diagnosis points to an appendix or gall-bladder, the removal of the diseased organs leads, in a great majority of cases, to a complete cure and prevents the formation of an ulcer.

Functional constipation causing hyperacidity must be treated appropriately in order to prevent ulcer formation. Dietetic regime is the most valuable item in the treatment. The food should be non-irritating but still bulky. Cereals well prepared (excluding rice and barley); vegetables in purée form partaken of in large quantities; fats in the form of cream, butter and olive oil, 1 tablespoonful 3 t. d. before meals, are very efficacious. Meats should be taken in small quantities, not fried or seasoned, so as not to excite excessive secretion. Fruits like baked apples or apple-sauce or fruit jellies, later peeled ripe apples, cherries, pears, plums are allowed. Because of the tendency to gastric irritation and the predominance of the descending type (spastic) of constipation it is best to avoid eating berries, because of the seeds they contain, until the gastric symptoms and objective signs of spastic constipation disappear.

As to medication, belladonna is doubly valuable, because it serves as an antacid and antispasmodic. It may be given either in powder form, as the extract, 0.01, 3 t. d., one-half hour after meals, or in suppositories, 0.02, 2 t. d. Olive oil enemata, 8 ounces, to be retained overnight, for one week every night and then every other night to the end of one month, and then once a week for another month, and finally an oil enema at night when one or two previous days show constipated movements. The evacuation of the oil, even with a satisfactory movement, should be followed by a small soapsuds or saline enema, in order to wash away the oil from the colon, thereby avoiding the irritation that may result from the fatty acids formed. Some patients are irritated by the pure oil; to avoid this the oil can be prepared with a teaspoonful of sodium bicarbonate in the form of an emulsion.

The treatment outlined, if conscientiously carried out, brings about gratifying results, so that the symptoms of hyperacidity and constipation may disappear forever. The patient is advised that the first recurrence of the symptoms will necessitate a repetition of the treatment.

The direct influence of massage on constipation, by furthering the fecal contents toward the sigmoid and rectum, has been shown by means of roentgen rays to be fallacious. Nevertheless, massage in the atonic type of constipation has a beneficial effect by raising the tone of the abdominal and intestinal musculature.

3. *Focal Infection.* As to prevention of ulcer of the stomach by the removal of focal infections, like pyorrhea alveolaris and tonsillar and prostatic infections, the undertaking is more difficult. We have already stated that our clinical conviction does not permit us fully to accept the infection theory of ulcer of the stomach. It is, however, plausible that once an ulcer is formed the healing is prevented by an infection. This might explain the seasonal exacerbation of symptoms in ulcer corresponding to the time of the year when tonsillitis is prevalent.

As a word of caution it must be emphasized that before radical measures are taken to treat the local infection—be it teeth, tonsils or prostata, we should have a positive diagnosis established by competent specialists—the bacteriologist, roentgenologist and clinician.

Internal Treatment of Ulcus Ventriculi. Since the inception of the extremely strict treatment of ulcus ventriculi as advocated by von Leube and Ziemssen, modifications have been abundant. There has hardly been a gastro-enterologist of importance who in the course of his career did not find that a modification of the original Leube treatment would be beneficial. Thus have originated useful methods, like the Bourget, Sippy, Einhorn-duodenal feeding, Lenhartz and Smithies, to be described in full. A great number of other modifications that have unfortunately flooded medical literature are not based on any scientific principle and shall not be mentioned. The modifications mentioned above, advocated and successfully carried out by experienced authorities, demonstrate to us that after all individualization, guided by proper judgment, is the only rational method.

In describing their respective methods the authors have aimed to meet the existing functional disturbances of the stomach and thereby give the ulcer a chance to heal. So have the older clinicians, von Leube, Ziemssen, Ewald, Einhorn and Boas, advocated complete rest to the stomach, which in turn would subdue secretions and acidity and stop hemorrhages if present.

Bourget, Fleiner, Sippy and J. Kauffman have chiefly aimed at neutralization of existing acidity as a most important factor in bringing about a cure.

These principles hold good in the typical cases when an ulcer in

the florid stage gives rise to either hemorrhage, excessive secretion and acidity, increased peristalsis or pylorospasm and accompanying pain. In describing the various methods of treatment we shall give our reasons why one or another method is preferable.

The more advanced diagnostic methods have taught us, however, that ulcer of the stomach exists in a fair number of cases when the above symptoms are not outspoken. In order to treat such cases successfully it is necessary to know the causative factors of the existing symptoms, and we advise the following guide:

1. Is it a bleeding ulcer (occult, profuse)?

2. Are pains, hyperacidity and hypersecretion the main existing disturbances?

3. Is the patient entirely free between attacks, so that even mental, physical and dietary excesses have no influence? or must he always be very careful, and if so, why?

4. Is the ulcer coexistent with subacidity or anacidity?

1. *Bleeding Ulcer.* A. Occult. The frequency of occurrence of occult blood in ulcus ventriculi is estimated by Boas, Kuttner and others to be much higher than that in the Mayo Clinic. Statistics have only relative value, inasmuch as the material in a surgical clinic, with predominating callous ulcers, would show a smaller number of cases with occult blood.

It is agreed, however, that the frequent demonstration of occult blood in the stool, excluding all sources of error, indicates that the ulcer is in a progressive state, and treatment almost as strict as that for profuse hemorrhage should be carried out. It is important to know that the persistence of occult blood, notwithstanding exact treatment for a few weeks, causes suspicion that malignancy exists and justifies exploratory operation.

The dietetic treatment for both occult and profuse hemorrhage will be considered together. Management of a case in the course of profuse hemorrhage needs special consideration.

B. Profuse Hemorrhage. The intensity of the treatment will depend on the severity and the effect of the bleeding. The patient should be put to bed, flat on his back and the legs of his bed elevated; an ice-bag or an ice-water coil to the abdomen and a hypodermic injection of morphin (0.005) in order to allay anxiety.

Nothing should be allowed by mouth. The thirst and dryness in the mouth should be overcome by giving the patient small pieces of ice, but allowing him to swallow very little of it. Per rectum, by way of the Murphy drop method, one pint of a Ringer solution can be given twice daily. In many cases this course of treatment alone for two or three days suffices to bring the hemorrhage to a standstill. In very weak individuals it may be necessary to give 1 pint of a 18 to 20 per cent. glucose solution per rectum on the second or third day. When the symptoms due to hemorrhage are more alarming one should immediately resort to more stringent methods.

The so-called autotransfusion, which consists in bandaging the upper and lower extremities to obstruct the venous flow but not obliterate the pulse, is very useful. The intravenous injection of 5 c.c. of a concentrated sodium chloride solution is next in importance. If further means are necessary 20 to 50 c.c. of human serum intramuscularly is to be given. Coagulose, sterilized gelatin (20 c.c.) with or without calcium intramuscularly, or per os decoction of gelatin (15 in 150), 15 grams every two hours, emetin (0.015) intramuscularly and pituitrin, 10 to 15 drops intravenously, as well as thromboplastin, can be resorted to if necessary. Adrenalin should be given if the blood-pressure is very low. Essau in Germany and Mansfield in Nebraska advocate powdered alum in glycerin (10 in 100), 1 teaspoonful every two or three hours.

Stimulation is, as a rule, unnecessary, but if indicated, camphor intramuscularly may be employed. If the bleeding is profuse, so that an immediate replacement of fluid is of vital importance, hypodermoclysis of normal saline solution or the intravenous use of the same solution is to be employed. Still better is blood transfusion, because it serves as a hemostatic and at the same time stimulates the blood-making organs.

Fleiner advises gastric lavage with ice water, Ewald with hot water and Bourget with 1 per cent. liquor ferri sesquichloride solution. Lavage, as a rule, is dangerous and but seldom indicated. In some cases, when there is nausea and frequent emesis of blood-clots, no treatment is as good as lavage, with either of the above solutions, in order to wash away the clots and give the stomach a chance to contract.

Occult bleeding needs no active hemostatic measures, as a rule; in certain cases, however, long-continued occult bleeding leads to secondary anemia of such a degree that healing of the ulcer is prevented until blood transfusion and use of sodium cacodylate (0.05 to 0.1) intramuscularly, daily for a month, is employed.

If profuse hematemesis recurs within a comparatively short time, surgical intervention is indicated after the hemorrhage has stopped and the patient is in a fit condition. As a rule, however, gastric hemorrhages due to ulcer yield to medical treatment. Only rarely does it become necessary to resort to surgical intervention because of inability to stop the bleeding.

Dietetic Regime with Bleeding Ulcer. Feeding by mouth can begin the second or third day when there is occult bleeding, in profuse bleeding a day after hematemesis has ceased and there is no nausea or vomiting. It is important to note that we must be guided at the beginning of feeding by mouth by the sensation of the patient. In marked hyperacidity and hypersecretion, notwithstanding the existence of the occult blood, the pyrosis and the hunger pain make it necessary not to discontinue feeding by mouth at all.

In active bleeding the acidity symptoms disappear or diminish

because of the neutralizing effect of the free blood on gastric secretion. Here, too, the return to feeding by mouth is governed by the sensations (pyrosis and hunger pain) of the patient. The first day when feeding by mouth is begun 2 tablespoonfuls of ice-cold certified milk is given every hour from 7 A.M. to 10 P.M., and during the night in the case the patient awakes. If this is tolerated the quantity is doubled the following day and tripled on the third day. Experience teaches that patients who otherwise had an aversion to milk welcome it and bear it well after gastric bleeding. In milk the patient has a bland, easily digested and non-irritating form of all the three articles of food, in addition to that the necessary fluids, hemostatic calcium and other salts. During this time 1 pint of 10 to 20 per cent. glucose solution can be administered by rectum in the morning after the bowels are cleansed by a soapsuds enema and 1 to 2 pints normal saline by the drip method.

Hamburger prefers the use of plain lukewarm water per rectum, claiming that additions like glucose or salt may reflexly irritate the stomach. We see no reason for this overanxiety, our experience justifying the belief that a physiological salt solution or a glucose solution is absorbed better and is much less apt to cause irritation of the colon than plain water.

During these three days the ice-bag can be removed and a Priesnitz compress substituted, to be changed every twelve hours. On the fourth and fifth days we allow 200 gm. lukewarm milk every two hours from 6 A.M. to 10 P.M.; to every second feeding 2 tablespoonfuls of sweet cream are added to the milk. If the patient has no complaints we extend the intervals of feeding to three hours, 200 gm. of lukewarm milk and 50 gm. of sweet cream, and every second feeding add two soft-boiled eggs. This is given for the sixth and seventh day.

If there is no gastric discomfort (burning, light pain) the Priesnitz compress is sufficient; when there is some discomfort hot flaxseed poultices or a hot-water bag can be applied to the epigastrium for one or two hours, morning and afternoon.

If seven days after bleeding the patient is perfectly comfortable the following diet can be ordered for the second week:

Eighth and Ninth days:

7 A.M. 200 gm. milk and 50 gm. of sweet cream with sugar.

9 A.M. Farina cooked in milk in double boiler, served as a pap.
1 soft-boiled egg.
1 slice of dry toast with butter.

12 M. 2 soft-boiled eggs.
Oatmeal cooked in milk in a double boiler for two hours and served strained with butter.
1 slice of dry toast with butter.

3 P.M. 200 gm. of milk.
50 gm. of sweet cream.
2 zweibacks with butter.

6 P.M. Rice cooked in milk for two hours in a double boiler.
2 soft-boiled eggs.
2 slices of toast and butter.
9 P.M. 200 gm. milk.
50 gm. cream.
Zweibacks if desired.

If the patient awakens in the course of the night he can be served with 200 gm. of milk.

Tenth, eleventh and twelfth days:

7 A.M. 200 gm. of milk.
50 gm. of cream.
3 zweibacks with butter.
9 A.M. Farina prepared as above.
1 scrambled egg.
2 slices of toast with butter.
12 M. 50 gm. of either minced veal fried in butter, minced lamb, or minced chicken.
2 tablespoonfuls of mashed potatoes with butter.
Spinach or carrots in purée form.
2 slices of toast with butter.
4 P.M. 200 gm. of milk.
50 gm. of cream.
3 zweibacks with butter.
7 P.M. Cereals.
2 soft-boiled eggs.
2 slices of toast and butter.
Spinach or carrots.
10 P.M. 1 cup of warm milk.

Thirteenth and fourteenth days:

7 A.M. Milk and cream.
2 zweibacks.
9 A.M. Cereal.
2 soft-boiled or scrambled eggs.
Toast and butter.
12 M. 100 gm. thickly prepared and strained barley soup.
75 gm. scraped beef or chopped chicken or calf's brain or boiled fish.
100 gm. mashed potatoes, spinach, carrots or green peas or the flowers of cauliflower, all in purée form.
50 gm. farina or rice pudding.
1 stick toast if desired.
4 P.M. 200 gm. milk with 50 gm. of cream, flavored with cocoa if desired.
3 zweibacks with butter.
7 P.M. 2 eggs (soft-boiled).
Toast and butter.
Custard.
10 P.M. Milk and cream.

At the beginning of the third week after the hemorrhage the patient is allowed to leave the bed with the understanding that he must rest the greater part of the day reclining on a couch.

Diet for third week:

7 A.M. Milk-cream and toast (flavored with cocoa if desired).

9 A.M. Cereals.
2 soft-boiled or scrambled eggs.
Dry toast and butter.

12.30 Cereal; soup; meats—such as chicken, fish, veal, lamb, 100 gm., and if patient can chew well the meat must not be chopped.
100 gm. mashed potatoes with butter.
Vegetables as in preceding week.
Apple-sauce and light puddings.

4 P.M. Milk or cocoa or light coffee or tea with milk and zweibacks.

7 P.M. Eggs or boiled unsalted and lean ham.
Cream cheese.
Custard.
Toast, butter, cooked vegetable.

10 P.M. Milk and cream.

The second and third week the patient is overfed, with the object of replacing the weight lost, and if possible he should even gain weight.

During the fourth and fifth week the patient is allowed to leave the house for short walks; short rests are enforced after light meals and one or two hours' rest after the chief meals.

Diet is the same as in the third week, with larger quantities if desired by the patient. The following additions are allowed:

Vegetables: Baked potatoes, asparagus tips, string beans, Brussels sprouts.

Fruits: Prunes in purée form, cooked cherries, cooked pears in purée form.

White bread one day old and not toasted.

During the sixth week longer walks are allowed and one hour's rest only is required after the main meal. The diet is so arranged as to be fully suitable to the time when the patient is allowed to follow his occupation.

He gets his first meal at 8 A.M., consisting of a baked apple with sweet cream, 2 eggs, cereal, roll with butter, light coffee, tea or cocoa.

Noon meal depends on whether the patient has two hours' time, so as to take his main meal and rest an hour after, or only one hour, necessitating a light lunch.

Medicinal treatment, when feeding by mouth, is begun on a fasting stomach, 10 to 20 gm. of bismuth subnitrate thoroughly mixed in 150 gm. non-sparkling carbonated water (Vichy Celestins)

sipped slowly a half-hour before breakfast. Such a mixture serves as an antacid, is mildly hemostatic and coats the stomach.

After each feeding the Bourget method of using alkalies has been found by us to be very efficacious. Bourget reasoned that a solution of bicarbonate of soda when given on a full stomach passes through the fold of Retzius directly to the pylorus into the duodenum, from whence it regulates the opening of the pylorus, overcoming the spasm and causing a more rapid emptying of the stomach.

This property of bicarbonate of soda solution indicates that the antacid effect of the drug does not lie in its concentration but in its reflex action from the duodenum. It is therefore not necessary to use bicarbonate of soda in doses large enough to neutralize all the acid, which would be injurious. Bourget found that 1 per cent. of bicarbonate of soda solution is enough to diminish the acidity and overcome the spasm of the pylorus. This is administered not only at the height of acidity but whenever the patient has pain or pyrosis. It is given well diluted, to be sipped slowly from one-half to one hour after light meals and one to two hours after a heavy meal.

The original formula is the following:

Sod. bicarb., 1,
Sod. phosph., 0.3,
Sod. sulph., 0.2,

to be dissolved in a half glass of water. If this method of administering the alkaline treatment is not fully sufficient to overcome pyrosis or pylorospasm it may alternately be replaced by the following powder:

Natr. bicarb., 1,
Magnes carb., 0.5,
Natrii citrici, 0.5,

dissolved in a half glass of water and administered as above.

If, on account of the excessive milk and the alkalies, diarrhea is troublesome we can, besides the morning dose of bismuth, add 1 of bismuth to every second powder.

If constipation is the troublesome factor the morning dose of bismuth should be reduced to half the quantity or given in suspension with olive oil. In order to improve the taste the emulsion is given in the following formula:

Bismut. subnitrate, 10,
Olei olivarum, 15 to 20,
Pulv. acaciæ, q. s.
Aqua amygdal., dulcis ad 100.
Sig.—To be taken every morning.

As the symptoms subside, which is usually the case at the end of the first week, the patient takes the alkaline powder in a full glass of carbonated water, one-third of which is sipped slowly a half to one hour after each meal.

In most cases the outlined medicinal treatment suffices. Rarely

pylorospasm and pyrosis during the first few days necessitate the use of atropin sulphate, 0.0005 to 0.00075 intramuscularly twice daily or extract. belladon., 0.02 in suppositories twice daily. This is especially useful in vagotoniacs.

Of equal importance to the treatment outlined thus far is an understanding of the general management of the patient. Particular attention must be paid to the hygiene of the mouth. So long as no food by mouth is given, frequent rinsing of the mouth with a mild alkaline is very essential and chewing of paraffin wax. When feeding is begun rinsing of the mouth after each meal does away with the sour taste after taking milk.

A sponge bath should be given twice daily; passive movements and light massage are essential. We should see to it that the patient spends a restful night. Often intestinal distention is a disturbing factor and is best overcome by a saline enema before relaxing.

When the patient resumes his work the dietetic regime outlined for the sixth week should be adhered to for at least six months. Alkaline water (Vichy) should be taken after meals, 150 gm. The patient is cautioned against nervous excitement and physical overwork, and if a smoker he is made to give up or greatly reduce the use of tobacco. After the sixth month raw fruit in the form of a ripe banana, ripe apple peeled and well chewed or pears may be allowed. Fruits containing seeds, as well as spicy food and alcoholic beverages, should be interdicted.

The treatment of bleeding ulcers outlined above has proved valuable in most clinics.

In 1904 Lenhartz, of Hamburg, expressed the view that the extreme sparing diet advocated by Leube is not only not conducive to healing of the ulcer but prevents healing and may cause formation of new ulcers. The prolonged starvation, he believes, causes secondary anemia, and as the food allowed is insufficient to bind the free acid, the factors for the non-healing and formation of new ulcers are thus given.

Again, the cases of ulcer where hyperacidity, pylorospasm, benign stenosis or other gastric complications lead to secondary anemias need individualization, as described below, in order to bring about improvement or, if possible, cure.

The entire Lenhartz dietetic regime seems to us to bear criticism. Meat is allowed too early, with the idea of binding acidity. While correct in principle it is also true that meat stimulates more acid secretion, especially in the second phase of digestion (chemical phase, Babkin). In order to give plenty of calories, according to Lenhartz, eggs are given in very large quantities and in a form which must necessarily become obnoxious to the patient. He omits fat, which in the form of sweet cream is rich in calories, and diminishes acidity reflexly from the duodenum and is not irritating at all. It seems to us that for the reasons outlined the Lenhartz treatment has lost

its popularity, although it originated in the mind of such a great authority.

Patients with ulcus ventriculi who never had hemorrhages and who periodically come to us with pain, hyperacidity and hypersecretion and various degrees of motility disturbances are the cases for whom modifications in the method of treatment have not been lacking. The original strict method of von Leube that the diagnosis of ulcus ventriculi spells absolute rest in bed for from two to three weeks, and extreme caution in feeding, as outlined in cases of gastric bleeding, had to undergo changes for obvious reasons

Most authors have sought to subdue the existing functional disturbances of the stomach, thereby favoring the healing of the ulcer, and all have registered favorable statistics. Judging by the improvement of the patients they were amply justified. Lasting results were unfortunately not obtained in a marked percentage of cases, so that the validity of internal treatment of ulcer has of late been questioned. Such skepticism and reaction seem to us to arise from the fact that the therapeutic procedure and results are not preceded by investigation as to the pathological status of the ulcer when treatment is begun, and the changes that took place in the ulcer and its effect on the functions of the stomach when the patient is discharged improved or cured.

Læo Schuller and Hamburger were first to utilize the roentgen rays and other clinical methods for the study of the effects of treatment, a very worthy addition to the therapeutics of ulcus ventriculi.

In order to understand what results are to be expected of treatment we must picture to ourselves the existing pathological process. It is known that an ulcer of the stomach may exist on the mucosa and submucosa, eroding the bloodvessels and causing bleeding. This usually heals, leaving superficial scar tissue, sometimes not even recognizable on the postmortem table. If such an ulcer does not heal the destruction of larger vessels, with the resulting local thrombosis and necrosis, causes a deeper ulcer, reaching the serosa and even perforating beyond, an occurrence fortunately not frequent. It is therefore not so difficult to direct the treatment and prognosticate a bleeding ulcer. In most cases after a successful course of treatment the symptoms may never return; on the other hand, recurrence of hemorrhage indicates surgical treatment.

In chronic recurrent non-bleeding ulcers the healing process is that of connective-tissue formation. It was pointed out by Orth that ulceration may be formed on the smooth base of the newly formed tissue—an explanation for the recurrence of symptoms.

With each recurrence there is additional connective-tissue formation. In very many cases the connective-tissue formation is of moderate extent so that no stenosis results even if the ulcer is situated at either ostium of the stomach. In these cases the motility disturbances are dependent on the hypersecretion and hyperacidity.

In other cases the connective-tissue formation is excessive, resulting in stenosis if near the ostia and very marked motility disturbances if even on the lesser curvature. The pathological changes being of such a varying degree we consequently must assume that the mode of treatment would have to vary accordingly.

Of equal importance for successful therapeutic measures in ulcus ventriculi is an exact knowledge of the disturbed functions of the stomach causing the existing symptoms.

The main and most easily diagnosed class of patients who present themselves with hyperacidity, hypersecretion, pain, disturbed motility of various degrees of periodicity, etc., are best treated by one of the following methods:

First to deserve mention, because of its efficacy and simplicity and because it is based on sound reasoning and experience, is the Sippy[1] method. The underlying principle of this treatment is the complete subduing of the free HCl.

An important adjuvant to the successful medical treatment of gastric ulcer has been made by Einhorn in the form of duodenal alimentation. Methods of introduction of the tube have been described by Einhorn,[2] Gross[3] and Held, Holzknecht[4] and Lippman.

Smithies[5] has advocated a course of treatment of ulcus ventriculi which deserves mention.

The method advocated by Stone[6] consists in the avoidance of carbohydrates in order to prevent fermentation.

Of late there has been an inclination on the part of some to advocate the ambulatory treatment of ulcus ventriculi, claiming good results. We decidedly question whether many of the cases so treated were really ulcers. However, the economic condition of the patient may be such that a compromise becomes necessary, though, on general principles, this is not proper. We must be clear in our mind as to the exact underlying functional disturbances of the stomach and be assured that ambulatory treatment will yield the desired success.

Individuals suited to such treatment are mostly of the sthenic type, in whom the gastric disturbances have a tendency to disappear as soon as a bland diet is resorted to and who have long intervals of freedom from symptoms. Finally, even when the symptoms are present the chemical as well as the roentgen-ray findings show a moderate degree of disturbance.

Of what does the ambulatory treatment consist? We insist on our patient adhering strictly to the following rules:

Restriction of work as much as possible for the first two weeks; to rest for from one-half to one hour after each meal, depending on

[1] Jour. Am. Med. Assn., May 15, 1916.
[2] Med. Rec., 1910.
[3] Jour. Am. Med. Assn., August, 1915.
[4] Munch. Med. Woch., September, 1914.
[5] Am. Jour. Med. Sc., 1917, p. 54.
[6] Jour. Am. Med. Assn., January 25, and September 30, 1916.

the quantity taken; to take his meals more frequently and obey strictly as to quality and quantity. All mental excitement and bodily fatigue must be avoided. A Priesnitz compress over the abdomen should be applied overnight and a light flannel abdominal binder should be worn for the day during the cool months.

Diet: The first week, if there is marked pain, the patient is allowed, until pain subsides, lukewarm milk every three hours, daily quantity between $2\frac{1}{2}$ and 3 liters. For patients who do not tolerate milk alone we may add either some lime water to the milk or, mornings and evenings when the patient is at home, add a fine cereal (hominy) to the milk. We can also increase the nutritive value of the milk by adding a half-pint of sweet cream during the twenty-four hours.

Second Week—Morning: One or two soft-boiled eggs, cereal, milk soup, one cup of milk. 10 A.M.: One cup of milk with cream, two zweibacks and butter. Noon: One or two eggs, cereal, milk soup, one cup of milk. 4 P.M.: One cup of milk, two zweibacks and butter. Evening: Two eggs, cereal, milk soup, milk with cream two zweibacks and butter. 10 P.M.: One cup of milk.

Third week: Besides the foodstuffs mentioned in the first two weeks, the patient gets 60 gm. of scraped beef or minced veal, or scraped, cooked, unsalted ham, 50 gm. of mashed potatoes, or spinach or carrots in purée form and toasted white bread.

Fourth week, we add cereal puddings made with butter, milk or cream (non-flavored), and at the end of this week apple-sauce or baked apples.

Fifth week, we add to the list of meats, boiled chicken, chopped, sweetbreads or fish, and gradually increase the quantity of meat to 100 gm.

Medicinal treatment consists in the use of alkalies after meals, during the month of the treatment Karlsbad Muhlbrunn, 250 gm. taken warm one-half hour before breakfast.

Such a course of treatment, if successful, should teach the patient how to live hygienically and dietetically in order to avoid future recurrences.

The treatment outlined thus far is sometimes unsuccessful. If so, the cause is to be sought and treated, if possible. Among the determinable factors interfering with the healing of the ulcer and often causing new ulcer formation are:

1. Vagotonia.
2. Congenital or acquired enteroptosis, with its resulting atony.
3. Secondary anemia.
4. Gastric catarrh—as gastritis hyperacida or sub- or anacidity.
5. Ulcer coexistent with sub- or anacidity.
6. Benign stenosis.

1. Vagotoniacs, with their tendency to hypersecretion, hyperacidity and hyperperistalsis, even without organic disease of the

stomach, will be so much more subject to persistent gastric disturbances when ulcer has formed.

Treatment will have to be directed to the vagotonia. In addition to careful diet and necessary alkaline treatment the patient should receive appropriate hydrotherapeutic measures during treatment of the acute symptoms. Cool sponge bath in the morning or lukewarm half-bath with cool shower bath and Priesnitz compresses overnight —well-fitting abdominal binders are necessary.

Medicinally atropin sulphate (0.0005 to 0.0001), subcutaneously once or twice daily until the physiological effect is reached, or in the form of extract of belladonna, 0.01 to 0.02, in powder one hour after meals, or 0.02 to 0.03 in the form of suppositories twice daily. Belladonna and its alkaloid had a specific effect in paralyzing the vagus, thereby subduing the excessive gastric secretion and peristalsis. Vagotoniacs must adhere to a non-irritating and nourishing diet for the rest of their lives as well as to the hygienic and physical measures involved.

2. In the congenital enteroptotic it is of the utmost importance that no ambulatoric treatment be attempted. Absolute rest has here the double object of giving the ulcer a chance to heal and at the same time letting the patient gain in weight—an indispensable factor in these cases.

During the first few days frequent feedings (one or two hourly) are not desirable, as the motility is very markedly delayed. As retention of food is a greater factor in exciting secretions than the largest doses of alkalies can neutralize it is obvious that the small quantities of food (two or three ounces) every three hours for the first three or four days is the better plan. When we proceed with larger quantities it is best to administer the food in the form of semisolids like thickly prepared cereals in milk, later vegetable purée; during the third week scraped beef or chopped meats, and later jellies, cooked fruit in purée form, etc. Emphasis is especially laid on the use of more solid food because excessive amounts of fluid (as is the case with milk diet) cause sagging and more loss of tone of the stomach musculature.

Lying on the right side after each meal for half an hour will facilitate the emptying of the stomach. If during the first week, notwithstanding the small quantities of food taken, there are signs of gastric retention, lavage of the stomach with one-half to one pint of alkaline water is to be employed, to be entirely returned, mornings and before retiring, for the first two or three days. For another two days, mornings only, using but half a pint of water, and, if necessary, for another two or three days the dry method of lavage (Boas), which consists in the introduction of the tube and obtaining the contents by expression.

Medicinally: Tonic treatment in the form of iron, arsenic and strychnin or phosphor, arsenic and strypsin (serum neurasthenique) intramuscularly.

The acquired gastro- or gastro-enteroptosis is due to the fact that the patient cannot or fears to partake of sufficient food for an extended length of time. The resulting gastric symptoms are more due to the existing atony of the stomach than to the ulcer proper. Prolonged unsuccessful treatment for ulcer leads both patient and attending physician to despondency, and surgical intervention is advised. When the tone of the stomach is lost surgical treatment for the ulcer does not, as a rule, yield the desired results. The treatment in general corresponds to that outlined for congenital cases.

Prognosis as to improvement of the tonus is here very much better than in the congenital type. Well-fitting abdominal binders are very useful in both varieties.

3. Secondary Anemia. Patients with atony of the stomach secondary to ulcer often present themselves with marked secondary anemia, so that the hemoglobin may be as low as 50 per cent., even 40 per cent. Here active treatment by means of one or more blood transfusions must be instituted. Treatment that ignores the anemia not only fails to heal the old ulcer but is even conducive to formation of new ulcers.

4. Gastric Catarrh. There are cases in which we find in addition to the ulcer definite evidence of coexisting gastric catarrh. In most of these sub- or even anacidity is present; in a lesser number hyperacidity is found. This catarrh, as mentioned elsewhere, may be the result of stagnation and fermentation, of food secondary to the ulcer or the individual afflicted with the ulcer has at the same time a circulatory or metabolic disease or an alcoholic gastritis. When the catarrh is directly secondary to the ulcer the outlined ulcer cure, with modifications to be mentioned, is very beneficial.

In sub- or anacidities large doses of alkalies are superfluous. The alkaline saline waters are beneficial and given in the following manner: Mornings, one-half to one hour before breakfast, 300 to 400 gm. of an alkaline sodium chloride water (Homburg, Karlsbad, Sprudel or Hawthorn Saratoga water) taken hot serves as an autolavage. Half the dose can be taken half an hour before supper. If this alone is not sufficient, lavage of the fasting stomach with 1 or 2 pints of a normal saline solution may be resorted to for about a week.

Meats should not be allowed in any form until all symptoms have disappeared, and then for a long time only finely chopped, because mucus even in small quantities interferes with chymification.

After meals, calcium carbon, 0.3, is to be given. HCl should not be employed, notwithstanding the low acidity, nor should spicy or irritating foodstuffs be allowed, as in achylia or ordinary gastritis anacida.

When hyperacidity is a factor the alkaline treatment, as outlined by Sippy, is very efficacious. In addition an alkaline water (350 to 400 gm.) on a fasting stomach, and half the morning quantity at

5 P.M. for one month, or lavage of the fasting stomach with an alkaline solution.

When metabolic or circulatory disease, besides the ulcer, is responsible for the catarrh the ulcer cure alone will only bring partial benefit unless appropriate curative measures are taken.

In these cases an annual spa cure is highly recommended, for one month, with mild saline waters for sub- or anacidity, and alkaline water when hyperacidity exists. When the patient cannot afford a spa, home treatment should be substituted.

5. For patients with ulcus ventriculi who present themselves with sub- or anacidity without catarrh, treatment must be modified according to the underlying cause of the condition. This sub- or anacidity has been attributed by most authors to a tiring of the peptic glands, due to their prolonged hyperactive secretions. This theory is plausible but cannot be proved.

We believe, as mentioned elsewhere[7] that other factors may be responsible for the sub- or anacidity. Vagotoniacs often change during or after middle life into sympathicotoniacs, so that hyperacidity (vagotonia) during early adult life changes to sub- or anacidity (sympaticotonia). Another factor is extensive perigastric adhesions which when in the region of the pylorus mechanically prevent closure of same, thereby allowing the duodenal contents to regurgitate; also, adhesions to other adjacent organs diminishing contractability of the entire stomach and with this the secretions. Our reasons (sympathicotonia, adhesions) for the cause of sub- or anacidity would tend to explain why the ulcer symptoms persist notwithstanding the cessation of hyperacid secretion.

If the theory of the tiring of the peptic glands held good we ought to expect healing of the ulcer and disappearance of symptoms, which is not the case. It seems to us important to try to determine the causative factors of the sub- or anacidity in order to apply proper treatment. When sympathicotonia is a factor we must direct our therapeutic attention to the nervous system. Regulation of life, hydrotherapeutics and avoidance of exciting factors are as essential as the treatment of the ulcer proper. Spicy and seasoned or irritating foods must be avoided. The diet is almost the same as for ulcer with normal or hyperacidity. If examination of the stool shows that meat is not well digested it should be given chopped and well done, or left out of the diet list for one or two days each week; fats, carbohydrates, and vegetable purée should constitute the main articles of food. HCl should not be given; an alkaline saline water (Saratoga, Homburg, etc.), can be given, a wineglassful thrice daily after meals. Parathyroid tablets (0.001 to 0.01) after meals may be tried.

When gastric adhesions are the cause of the sub- or anacidity in ulcus ventriculi the treatment of the ulcer proper must be conducted

[7] Gross, Held: Interstate Med. Jour., 1917, No. 4, vol. xxiv.

as if we were dealing with normal or hyperacidity, as already described. If symptoms persist and are more or less continuous, local heat, either in the form of hot flaxseed (applied one hour mornings before getting out of bed and one hour before retiring) or fango (applied a few times a week) or heat in the form of diathermia should be instituted. Such treatment does not break up adhesions but it helps toward restoration of the gastric functions. If it is without effect, surgery is to be resorted to.

The operative interference has its beneficial effect, chiefly through gastro-enterostomy. Separation of adhesions is often technically impossible; strenuous efforts to do so have often led to postoperative emboli, and even if successfully separated adhesions too often reform. We see therefore that favorable results in gastric adhesions are dependent on relief of abnormal tension in the stomach and functional restitution.

6. Treatment of Delayed Stomach Action. A clear understanding of the pathological condition in the stomach which causes delay in the emptying is very essential. This delay is seldom due to an indurated ulcer in the region of the pars media (tube) on the lesser curvature. An ulcer in that location causes frequent vomiting. This may be due to a pylorospasm, with relaxation of the cardia. When delay in emptying occurs with an induration in that location, atony of the gastric musculature, with accompanying fermentation and pylorospasm, are the underlying factors. In very rare cases a second indurated ulcer in the pylorus may be the cause of delayed emptying, and medical treatment rather than surgical intervention should be instituted.

An indurated ulcer in the pylorus proper is the most frequent cause of delay. Not only are cases amenable to medical treatment when but small residues are found in the stomach twelve hours after a meal, but even when twenty-four-hour and even longer retentions are encountered. The reason for this is that the exit of the food is not, in most cases, prevented by the connective tissue filling out the entire pylorus. Such conditions call absolutely for surgical intervention.

We refer to cases where the associated atony of the stomach or the marked pylorospasm or pyloritis prevents the normal passage of food into the small intestine. The treatment will depend on the degree of stagnation as determined by the known motility tests, the chemical findings and the tone of the gastric musculature as demonstrated by the roentgen rays.

In cases in which twelve hours after a Bourget-Faber meal, or a rice and raisin meal, we obtain from the fasting stomach only a moderate quantity of fluid contents holding in suspension macroscopically visible food particles, with a high acidity and non-rancid odor, the following procedure yields very effective results:

The patient is put to bed for at least one week. For the first three

days a morning lavage with ½ pint of warm bicarbonate solution (½ teaspoonful to 250 gm.) to be returned by expression is indicated. For another two days the sound should be introduced on a fasting stomach and the contents obtained by expression without lavage, the so-called dry lavage of Boas. After that, for a month or longer depending on the subjective feeling, the patient should take 250 gm. of a warm alkaline water one-half hour before breakfast, sipped slowly (autolavage).

The most important factor is a proper diet. Being aware that the grinding power of the stomach is disturbed, acid secretions increased and the passageway narrowed, food of such nature must be given as needs the least chymification, does not excite gastric secretion and can even pass the narrow pylorus. During the first week, in bed the diet must be of a nature to spare the organ, and consists of the following:

For the first three days:

7.30 A.M. (half an hour after the lavage or the alkaline water):
120 gm. parboiled skimmed milk.
40 gm. warm water.
20 gm. lime water.

9.00 A.M. 120 to 150 gm. of well-cooked and strained barley gruel.

11.00 A.M. Same as 7.30 A.M.

1.00 P.M. Cream of wheat finely suspended in skimmed milk, half-diluted in water, salt and sugar to improve the taste, 150 gm.

3.00 P.M. Same as 9 A.M.

5.00 P.M. Same as 7.30 A.M.

9.30 P.M. Same as 1 P.M.

During this time 1 pint of a 5 to 10 per cent. glucose solution can be administered per rectum by the drip method twice daily.

After the third day and to the end of the first week:

7.30 A.M. 200 gm. cocoa cooked in water and served with one-half parboiled skimmed milk.

9.30 A.M. 200 gm. barley gruel.
1 gm. soft egg (put in cold water and removed just as soon as the water has reached the boiling point).

12.30 P.M. 250 gm. cream of wheat with whole milk.

3.00 P.M. 200 gm. parboiled milk with one-half lime water.

5.00 P.M. 1 gm. egg (as above).

7.00 P.M. Cocoa (as above).
1 gm. egg.

9.30 P.M. 250 gm. parboiled milk and one-fifth lime water.

If the patient is comfortable we may allow, the last two days of the first week, 1 zweiback three times daily. After each feeding the patient should lie on his right side for half an hour to an hour.

The second week, if the patient has improved considerably, he is

allowed to leave the bed for the greater part of the day, only resting on his right side for from one-half to one hour after meals. The intervals of feeding are lengthened to three hours, and the following diet is ordered:

7.00 A.M. Alkaline water.
7.30 A.M. 250 c.c. warm parboiled milk.
1 egg.
2 slices of toast with butter.
10.30 A.M. 250 gm. strained oatmeal served with warm milk.
1 egg (soft-boiled).
1 slice of toast with butter.
1.30 P.M. A cereal cooked in milk; second half of week mashed potatoes with butter.
Spinach or carrots in purée form, butter or cream added to increase nutritive value.
1 poached egg on toast or with the spinach.
1 slice of toast.
4.30 P.M. Weak cocoa and 2 zweibacks with butter.
7.30 P.M. A cereal with milk.
2 eggs, soft-boiled.
150 c.c. parboiled warm milk.
1 slice of toast with butter.

During the third and fourth weeks the patient may assume his occupation, but must be told to adhere strictly to all rules of diet. Alkaline water to be continued.

Breakfast: 2 soft-boiled or poached eggs; 2 slices of toast and butter; 200 gm. weak cocoa or parboiled milk.

Lunch should form the chief meal and consume at least from one to one hour and a half, including time for rest. Boiled chicken, chopped or minced veal or beef, rare and fried in butter, or soft lamb thoroughly chewed, or well-cooked fish, from 60 gm. to 120 gm., gradually increasing if condition improves. Mashed or baked potatoes, 75 to 100 gm. Carrots or spinach or cauliflower or green peas in purée form. Custard, farina, rice, tapioca pudding and apple-sauce, 50 gm.

4.00 P.M. cocoa and zweibacks.

Supper: Cereal in milk; omelette souffle or cereal pudding, with eggs and butter. Baked apple or ripe banana, with cream, dry roll or toast.

As to medicinal treatment it is our experience that the carrying out of the above dietetic regime will not necessitate any medication. However, should pyrosis be a factor an alkaline non-sparkling Vichy (Celestins, Saratoga), one wineglassful with meals, can be given. If this alone is not effective, magnes. ustæ, 1 gm., or bicarbonate of soda, 1 gm., can be added to the water. When there is reason to believe that pylorospasm exists (vagotonia) or spastic constipation,

extract of belladonna, 0.02 in the form of suppositories, can be employed twice daily.

If anemia and general loss of tone is a factor, sodium cacodylate, with or without iron and strychnin intramuscularly (0.03 in ampoules), 25 to 30 injections; also appropriate hydrotherapeutics are of service.

After the fourth week a list should be written down of foods the patient is allowed to have. For example:

Meats: Chicken, squabs, lean fish, lamb, veal, ham non-salted and cooked, beef, white of turkey, eggs.

Vegetables: Spinach, asparagus, cauliflower, carrots, turnips, Brussels sprouts, string beans, green peas, mashed potatoes.

Fats: Butter, 40 per cent. sweet cream.

Fruits: Cooked fruit—apples, pears, prunes, peaches, cherries. Also ripe bananas, melons without seeds.

Fluids: Milk, cocoa, buttermilk, zoölack, weak coffee or tea with milk, non-sparkling alkaline waters.

Cereals: Farina, tapioca, sago, rice, oatmeal, barley, cream of wheat, cornflakes.

All meats should be served plainly cooked, broiled or fried in butter, non-spiced, quantity not to exceed 150 gm. Eggs, soft-boiled, poached or scrambled.

Vegetables: Only in purée form, with butter, milk or cream.

Fruits: Peeled, stewed or baked.

Fluids: Those named in small quantities not exceeding 200 gm.

Cereals: Well-cooked, served with milk, butter or cream or in the form of custards and puddings.

The patient should be instructed that if symptoms of discomfort set in he must report at once for examination, as by so doing only can recurrence and progression of the disease be obviated.

After the main meal, lying on the right side for at least half an hour is essential.

The quantity of fluids should be restricted and no fluid outside of milk or cocoa should be taken with meals.

A well-fitting abdominal binder is beneficial where atony is an important factor in the course of stenosis.

The more advanced class of incomplete pyloric stenosis, as the result of a callous ulcer of the pylorus, which manifests itself by marked signs of gastric stagnation, requires a still more stringent method of treatment. It must be remembered that the underlying pathological condition causing the symptoms lies as much in the hyperemic gastric mucosa and pyloritis as in the callous ulcer itself. The treatment therefore must be directed toward a complete rest of the stomach until subjective and objective symptoms disappear.

The patient should stay in bed for from three to four weeks. A thorough lavage of the stomach with a mild alkaline solution should initiate the treatment. All stagnated food, as well as the tenacious

mucus, is thereby removed. No food by mouth is allowed for at least four to seven days. During that time rectal alimentation is to be administered, more for the purpose of carrying fluid to the system than for nutrition.

Unlike the ordinary ulcer treatment we must seek to supply the patient (as a rule in a state of emaciation) with as many calories per rectum as is possible. This may be accomplished by glucose solution (10 per cent.), 1 pint twice daily, to which 1 ounce (30 gm.) of 50 per cent. alcohol can be added (Smithies). One nutritive enema should consist of peptonized milk, 1 pint, and 1 pint of 50 gm. sweet cream; 1 gm. pancreatin; 5 gm. bicarbonate of soda suspended in 1 pint of normal saline solution. This enema should be given at 8 A.M., 12 M., 4 P.M., and 9 P.M. All nutritive enemas are to be given at body temperature and by the drip method.

The first rectal feeding should be preceded by a cleansing enema. In order to prevent intestinal irritation, which is often most marked during the night, 15 to 20 drops of tincture of opium can be added to the last nutritive enema.

During the period of rectal feeding the mouth hygiene described above is to be observed. In order to quench the thirst small quantities (60 gm.) of distilled water may be allowed four or five times daily after the first lavage; if pyrosis is annoying, even during the fasting period an alkaline powder should be added to the water.

When mouth feeding is begun we must allow food only in such form as would most easily pass the pylorus, and for a time neither demand motility nor invoke digestive activity of the stomach. Carbohydrates in a fluid form are most appropriate, because they need no stomach digestion, they are nutritive, and prevent starvation acidosis even if the patient is underfed; furthermore, as carbohydrates do not bind the free acid, the latter serves to open the pylorus.

Proteins and even some fat can be administered in the form of very soft-boiled eggs, because in such form they pass the stomach at once (Cannon). Skimmed, well-diluted milk may also be allowed.

Carbohydrates are administered in the form of thin, well-prepared and strained barley soup or in the form of cream of wheat or strained oatmeal. Quantity of fluid at each feeding should not exceed 100 to 120 gm. during the first four to seven days of mouth feeding. Add to this three or four eggs either alone or shaken up in the milk.

Feeding should be given every three hours from 7 A.M. to 10 P.M., in order to give the stomach a chance to empty itself between each feeding. Lying on the right side for at least half an hour after each feeding is very essential. During this week one or two rectal feedings with glucose solution is to be continued.

If symptoms indicate that the stomach does not empty itself, causing disturbances, especially during the night, dry lavage (Boas)

before retiring, followed by a warm alkaline drink (200 gm.) to serve as an autolavage and to neutralize the acidity, is very efficacious.

If toward the end of the second week motility or secretory disturbances manifest themselves, despite careful treatment, duodenal feeding is to be employed, first ascertaining that the duodenal tube has reached the small intestine. This is continued for from ten to twelve days and followed for three or four days by a milk-cereal diet.

During the third and fourth weeks, if the condition of the patient permits, the diet list outlined for the second week in milder cases of pyloric stenosis may be used. During his stay in bed, Priesnitz compresses to the abdomen, sponge baths morning and evening and light general massage should be employed.

Medicinal: Sometimes during the first and second week the symptoms of pylorospasm necessitate atropin sulphate (0.0005 to 0.001) hypodermically twice daily, or suppositories of extract of belladonna (0.02) also twice daily.

During the last two weeks of treatment some advise the use of strych. nitr. (0.001) hypodermically once or twice a day as a muscular tonic.

After four weeks the patient is allowed to leave the bed, with directions that food taken shall be well prepared in purée form, bread toasted (preferably milk-toast), and all food is to be thoroughly chewed. Fluid should be restricted.

Feeding should be in quantities not to cause fulness after a meal and should be given every three or four hours. Lying on the right side after the main meal is very important. This meal, if possible, should be had at the noon hour. These directions ought to be adhered to for an indefinite length of time—even for life.

Gastric lavage will not be needed if the rules outlined are followed. The first signs of motility disturbance, however, call at once for a lavage before retiring (at least three hours after the last meal) and a moderate restriction of diet for a few days in order to prevent recurrence.

If the patient can afford an appropriate spa or a cure at home for four weeks every year it is very beneficial. A well-fitting abdominal binder, especially for asthenic individuals, should be ordered.

Einhorn has advocated a special instrument for stretching the stenosed pylorus. We have no experience in the use of the instrument. We feel, however, that blind stretching is not a desired surgical procedure. If the stenosis is such as to require instrumental interference, surgical intervention is the safer and by far the more rational procedure.

DELAY IN THE TREATMENT OF CANCER.[1]

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During a period of about one and a half years, 103 cases of malignant disease entered the Cornell or First Surgical Division of the New York Hospital under the charge of Professor Gibson. At his instance a careful record was kept in each case of the duration of symptoms and the various reasons for delay in seeking treatment. Of the cases, 41 were classed as external, that is, the growth was visible or easily palpable, 60 were internal, 2 were not classified. Of the internal growths, 6 were of the rectum, 8 of the uterus, 3 of the cervix, 2 of the bladder and 2 of the prostate.

Of the total number of cases the average period from the onset of symptoms to the first consultation with a physician was 3.19 months and the average period from this time until the entrance into the hospital was 8.7 months. This gives a total of 11.89 months, practically a year, in the average case, from the onset of symptoms to the entrance into the hospital.

An attempt was then made to group the cases according to their curability on entering the hospital. This was done by Dr. Kenneth Johnson, house surgeon at the time, as it was felt his opinion would be unbiased. The classification adopted was: *Curable, Probably Curable, Operable, Inoperable and Incurable.* The advice of the physician first consulted was then considered in relation to each case of the various groups, being classed as right or good when he urged the hospital and an operation, wrong when he did otherwise.

The question of diagnosis by the physician was not considered.

Curable Cases. Of these there were 18. The advice given was right in 11, wrong in 7.

Probably Curable Cases. 35 in number. Right, 17, wrong 18.

Operable Cases. 71 in number. Right 37, wrong 34.

Inoperable Cases. 29 in number. Right 12, wrong 17.

Incurable Cases. 48 in number. Right 16, wrong 32.

Of the 101 cases classified, 44 received good advice from the first physician consulted, 47 did not.

Even if we make every allowance for misunderstanding and ignorance on the part of the patient the showing is appalling.

The data so far obtained are too meager for definite conclusions, but it is obvious that in the average case a considerable period of time is lost between the onset of symptoms and the first visit to a physician, that the physicians' advice is wrong in considerably more than half the cases and finally a much longer period after the first consultation is wasted before the patient enters the hospital.

[1] Read before the Society of Practical Medicine, February 21, 1917.

The data in the incurable cases would seem to bear out the ill results of the physician's wrong advice. Practically 50 per cent. came too late for a cure, and of these two-thirds had been poorly advised by their physicians.

The causes for delay in seeking surgical help are not far to seek—ignorance and fear on the part of the patient, possibly fear of losing a patient on the part of the physician. An ill-founded and careless optimism costs many lives undoubtedly. In extenuation it may be said that the average physician sees not more than 1 case of cancer a year, judging from the latest and best statistics available. It is too much to expect him to be able to make refined diagnoses under the circumstances, but he should be taught, and so should the laity, that every "lump" may be the seed or beginning of a cancer, and that an early slight operation offers far better prospects, than a late severe one.

My sincere thanks are due to Professor Gibson for permission to publish the data obtained in his service and to Dr. Kenneth Johnson for aid in tabulating them.

THE ANATOMICAL CHANGES AND HISTOGENESIS IN GASTRITIS GRANULOMATOSA FIBROPLASTICA.

BENIGN PYLORUS HYPERTROPHY, SIMPLE INFLAMMATORY CIRRHOSIS OF THE STOMACH, LINITIS PLASTICA.

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AND

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The occurrence of purely inflammatory sclerosing thickenings of the stomach, notably in the pyloric region, which are not of congenital or cancerous origin, has received little recognition up to the present time. Indeed, this occurrence has even been questioned and denied in recent years. It is true that the early literature on the subject is little convincing, for the incompleteness with which anatomical findings were recorded and studied from Cruveilhier[1] to Brinton,[2] and in many instances even later, hardly allowed any definite opinion in this regard. The chief questions at issue were

[1] Anatomie Pathologique du corps humaine, Paris, 1835, tom. iii, p. 25 (Lyle), or, 1829–1831, tom xli (Krompecher).

[2] Diseases of the Stomach, 1864.

whether such hypertrophic scleroses were always either congenital or, if originating in later life, simply masked a scirrhous cancer. However, in view of the more complete recent studies, particularly by Tilger,[3] von Sury,[4] Curtis,[5] Krompecher[6] and Gruner,[7] there can no longer be any doubt that there exist cases of localized or more diffuse, sometimes extraordinary, thickenings of the stomach, which develop during adult life and are not tumors in the usual sense of the term. The investigations of Tilger and the quite recent ones of Krompecher deal with the subject in an exhaustive manner and also review critically the previous work as well as the history of the various conceptions in this regard. It is therefore unnecessary to record these here. The article by Lyle[8] has also a good bibliography appended. It will only be necessary to sketch briefly once more the chief features of the disease and the various views as to its pathogenesis and histogenesis.

Anatomically and histologically these cases are characterized by a pronounced but variable thickening of the walls of the stomach, more especially of the pyloric region. This thickening involves particularly the submucosa which, even on gross examination, stands out prominently and is pale, pearly glistening and smooth. It is either purely sclerosed or more or less cellular, fibroplastic and occasionally has been reported to show endarteritic changes. The underlying muscularis shows generally marked hypertrophy. The conditions of the mucous membrane and serosa appear to show great variations. The former has been reported as hypertrophied, its connective tissue as thickened and hyaline and occasionally infiltrated with inflammatory cells; again, as superficially necrotic and the deeper portions much overgrown by inflammatory cells. The serosa has been described as edematous, with hyaline thickening, but also as little or not involved.

The interpretation of these changes has been difficult and attempted in various ways. While most observers look upon the process as inflammatory the genesis and etiology have always remained much disputed. Some bring it into definite relation to alterations or infections of adjoining structures; for instance, the gall-bladder or chronic sclerosing lesions of the peritoneum; but if such a connection exists at all its genetic relation has remained uncertain, and these ideas are certainly not applicable to many cases. Some instances have been traced to phlegmonous gastritis or ulcers, or the mucous membrane has at least been held responsible as the port of entrance or primary focus of infection. Syphilis and tuber-

[3] Virchows Arch., 1893, vol. cxxxii.
[4] Arch. f. Verdauungs Krank., 1907, vol. xiii.
[5] Arch. d. méd. expérimentale, 1908, xx.
[6] Ziegler's Beiträge, 1910, xlix, 384.
[7] Bulletin from the Royal Victoria Hospital, August, 1912, No. 2, p. 149, and especially p. 153.
[8] Annals of Surgery, 1911, No. 5, liv.

culosis have been looked upon as etiological factors, the former particularly on account of the occasional vascular changes in the submucosa. The majority of writers agree that the thickening of the submucosa is primary and leads to functional hypertrophy of the musculature.

Krompecher, on the other hand, in a study of 9 cases, traces the lesion to a general circulatory disturbance and venous stasis, which lead to edematous swelling and collaginous hypertrophy of the connective tissue of the stomach in the manner described by Unna. Muscular hypertrophy he also regards as secondary and functional. He questions, but does not deny, the inflammatory character of the lesion, but regards the disease essentially as a local manifestation of a systemic disease.

The 2 cases here reported belong to the category under discussion. The material of both was obtained during the life of the individuals by operation and the examination of the tissues, therefore, limited to these parts. However, in each case the disease seemed well localized to the removed portions, which even went beyond the affected areas, thus allowing complete examination of the local lesion and comparison with the neighboring unaffected parts.

The disease has already been discussed from the clinical standpoint with a resumé of anatomical findings in a previous paper by one of us.[9] We present here the detailed report of the anatomical and histogenetic characters of this lesion as based upon the last two cases observed in the Royal Victoria Hospital, Montreal.

Case I.—The specimen, removed by operation, represents the pyloric end of the stomach and measures 8 cm. in length. The wall is 1.5 cm. in thickness at its thickest portion, this thickening being particularly at the expense of the submucous coat. The mucous membrane showed numerous but superficial ulcerations (covered by barium), but these ulcerations did not extend into the deeper tissues. The thickened wall was firm but not of the stony hardness frequently encountered in scirrhous cancers. The serous coat was smooth and pinkish. Microscopic examination of various parts showed essentially the following lesions: The submucous coat is diffusely and densely infiltrated by lymphoid cells. This infiltration obliterates in parts the boundary of the mucosa and submucosa and becomes continuous with a similar infiltration of the lower parts of the mucous membrane, in which are also involved the lymphatic follicles by process of hyperplasia. Thus mucosa and submucosa are gradually overgrown by lymphoid cells, which rest and extend within a thin reticular tissue. In other and apparently more recently extended parts the lesion presents itself in marked perivascular lymphoid-cell infiltrations confined to the deeper portions of the submucosa while

[9] Armstrong: Scientific Reports of the Royal Victoria Hospital, 1916, Series B, No. 1.

its upper part and the mucous membrane appear intact. The glandular elements of the mucous membrane do not seem to play an active part in the process at all, but when they have become overgrown by lymphoid cells, and probably also have been damaged by nutritive changes, local necrosis ensues and the mucous membrane shows rather superficial ulcerations. If one now examines parts of what appear to be the well-established and older processes the lesion seems to play in and progress particularly in the submucosa. In this are also found definite arterial changes. These in the larger vessels are an endarteritis obliterans associated with thrombus formation, and even in the smaller vessels endothelial proliferation leading to thickening of their walls is evident. In these older foci there appears an irregular rather unhealthy fibroplastic proliferation displaying a tendency to necrosis and karyorrhexis. In the deeper portions of the submucosa there has thus been produced a mature thick and hyaline but unhealthy fibrous tissue. While in the upper portions of the submucosa the tissue shows greater uniformity in lymphoid cells the type becomes polymorphous in the deeper and older parts. There are lymphoid and epithelioid and occasionally very definite giant cells. Some of these may be due to thrombosed capillaries. The lesion stops rather abruptly at the muscular coat. This remains unchanged and undergoes moderate hypertrophy. The serous coat is moderately thickened by fibrous tissue, well separated from the muscular coat and shows some perivascular lymphoid infiltration, with thickening of its bloodvessels. It must be added that the operation revealed that the patient was also suffering from cirrhosis of the liver.

Case II.—The specimen, removed by operation, consists of the pyloric end of the stomach and a small portion of the duodenum, the whole measuring 9 x 7 cm. The pylorus, to an extent of about 4 x 3.5 cm., is greatly thickened, and about 1 cm. from the ring there is a puckered depression, evidently an ulcer. Around this there is much induration of all coats, which, at the thickest point, amounts to 1 cm. This involves an area about the size of a walnut, and it is covered by smooth peritoneum, which shows much less thickening than the serous coat. Accompanying the specimen are several hard lymph nodes.

Microscopically the coats of the stomach, with the exception of the serosa, are all thickened but well differentiated. The mucous membrane is well-defined from the underlying extremely thick and fibrous submucous tissue and sits straight upon it. Only isolated thin streaks of fibroplastic and lymphoid cells are seen to occasionally extend from one into the other. Where the mucous membrane over these thickened areas is best preserved it shows hypertrophy of the mucosa with accentuation of its villous arrangement and large well-formed glands with delicate basement membrane and high cylindrical epithelium, separated by cellular septa of the tunica

propria. These areas interchange with others in which the superficial portions of the mucous membrane are deeply infiltrated by lymphocytes which overgrow the glands and tunica propria and obliterate them. The deeper parts of the mucous membrane show throughout marked dilatation of bloodvessels and lymphatics which are frequently filled by coagulated lymph. The massive lymphoid-cell infiltration of the deeper portions of the mucous membrane obscures the glandular elements of these parts and the muscularis mucosa is indistinct, but the mucous membrane shows nowhere any fibrous or even young fibroplastic tissue. However, the submucous coat presents marked thickening by well-developed fibrous tissue. Within this occurs narrow or broad streaks and aggregates of small lymphoid cells following the course of lymphatics and perivascular spaces. These show here also marked dilatation. In the deeper portions of the submucous coat the connective tissue assumes a hyaline, diffuse appearance. The underlying inner circular muscular coat shows marked hypertrophy. Within this musculature occur streaks and sometimes irregular large areas of inflammatory cell infiltration taking their origin apparently from lymph and tissue spaces. These assume gradually sufficient dimensions to replace patches of musculature. The most recent smaller streaks and areas are made up of cells which are mostly of lymphoid character. The older patches are avascular, fibrillar and cellular granulation tissue, poorly nourished and somewhat necrotic. Thus the muscular coat is interrupted and intersected throughout by these patchy granulomatous-cell infiltrations and loose scar tissue. A somewhat similar but less extensive state of affairs exists in the outer longitudinal muscular coat and the adjoining serosa seems to be involved in places, but only little and very interruptedly.

The enlarged glands which accompanied the specimen showed only inflammatory hyperplasia and lymph stasis.

To recapitulate and sum up:

Neither case is a cancer or a tumor. Both cases represent apparently closely related inflammatory changes within the stomach wall. These appear in the first case of more recent and active character than in the second case. Throughout they carry the distinguishing feature of a granulomatous inflammation, which, in the second, has proceeded to much greater cicatrization. In both the submucous coat suffers more severely and generally, while the first shows a characteristic endarterial involvement of the bloodvessels. In both cases occurs engorgement of bloodvessels and evidence of lymph stasis; in both the muscular coat is hypertrophied, and this is much more pronounced in the second and older case than in the first. This latter also shows an extension of the granulomatous process to the circular layer of the musculature. Finally, in both the serosa shows only slight and irregular involvement.

In regard to the genesis of the lesion:

In both cases, particularly in the first and more recent one, the impression prevails that the involvement of the glandular part of the mucous membrane is a secondary occurrence. On the other hand the lesion becomes manifest earliest in the submucous coat and the lymphoid element of the mucous membrane and extends through and around lymphatics and perivascular spaces, to play most actively in the submucosa. The localized superficial necrosis of glandular parts of the mucous membrane, therefore, is in all probability not an essential element of the lesion. The hypertrophy of the musculature seems also to follow and to depend upon the changes in the submucous coat, a view strengthened by the fact that the more recent first case showed much less of it than the second more advanced one. Furthermore, the granulomatous involvement of the muscular coat which occurred in the second and advanced case also impresses one as following the changes in the submucosa.

From the foregoing it would appear that the cause of this peculiar granulomatous gastritis must be sought in an infection which reaches the stomach through and progresses within lymphatic channels. It is difficult to determine whether the infective agent gains entrance through the lymphoid elements of the mucous membrane or invades in the opposite direction from the outside. If one examines carefully the anatomical and histological findings of these and other cases from the literature it seems that both channels of infection are possible. It is interesting to recall in this connection that in one of our cases a liver cirrhosis was demonstrable at operation. After the infection has once reached the stomach and the lesion made its appearance the evidence in these and other cases indicates that it may remain localized to the pyloric region or may spread to involve more or less the whole of the stomach.

How much lymph and blood stasis are contributory is open to question. These cases cannot be explained on this basis alone.

In regard to the etiology:

It is of course not possible to make any definite statement from these findings, particularly as our knowledge regarding other anatomical conditions in the body is very incomplete. That the features were those of a granulomatous inflammation has already been recorded as well as the marked vascular changes in the submucosa of Case I. This is certainly suggestive of a specific inflammatory process, but whether tuberculous or luetic must remain uncertain. The evidence was not sufficient to establish this with certainty in either case and contributory evidence from other parts of the body was lacking.

As regards the name of the lesion:

Of the many names suggested that of "linitis plastica" is certainly most objectionable. The word "linum" and the phrase "rete ex lino factum" can, with the best stretch of imagination, only be

regarded as a description of the physical appearance of this lesion. The ending "-itis" attached to a name expresses an inflammation. The suffix "-itis" attached to linum therefore makes perfect nonsense.

The objection that the lesion does not represent a gastritis in the strict sense of the term can hardly be regarded as valid, inasmuch as sooner or later practically all the coats of the stomach, including the glandular elements of the mucous membrane, are involved and the mucous membrane may in certain cases possibly even be the port of entrance.

It seems, therefore, that the terminology which has been adopted at the beginning of this report or shortly after "cirrhosis of the stomach" expresses best the general anatomical character of the lesion.

SYPHILITIC AORTITIS AND ITS EARLY RECOGNITION.*

By George E. Brown, M.D.,
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The first anatomical studies of syphilis of the aorta were made by Morgagni in the middle of the seventeenth century. Later studies by Dohle, in 1888, and Marchand, in 1903, did much to arouse interest in this condition, though the proof they offered as to its etiology was not convincing. They described the pathological changes as a mesaortitis and were impressed with the frequency with which these pathological changes in the aorta were associated with evidences of syphilis elsewhere in the body, and presented the view that the aortitic changes were luetic. It was not until the work of Benda, Wright and Richardson that the absolute proof was found and the successful staining of the spirochetes in the arterial wall supplied the missing etiological link. The further application of the Wassermann test and roentgen rays have greatly increased the interest in this highly important condition. In searching the literature on syphilitic aortitis one is impressed with the paucity of information regarding this disease in the text-books, and attention is paid only to the terminal lesions as aneurysm and aortic valvulitis. I can advise one to read Dieulafoy's[1] classical pictures of aortitis, as it is the acme of clinical conciseness. If one wishes to pursue the subject more thoroughly, Allbutt's works[2] should be studied, as they are the most exhaustive in the English language. It would seem that specific aortitis occupies the same position in present medical literature as tuberculosis did thirty years ago, and only the full-blown cases are deemed worthy of note. More attention must be paid to incipient aortitis, as the only hope of cure lies in the diagnosis before gross changes have taken place in the arterial wall.

* Read before the Montana State Medical Association, July 10, 1918.

FREQUENCY. Statistics on the frequency of luetic aortitis are scanty, but enough work has been done to show that this type of aortitis is very common when diagnosed on the autopsy table but rare when reviewing clinical reports. This discrepancy may be explained in several ways: (1) that aortitis is often a latent manifestation of syphilis; (2) that signs and symptoms of its presence are either lacking or else so insignificant as to be entirely overlooked; (3) that the medical profession has not given this condition sufficient attention and careful examination of the aorta is slighted or else entirely ignored.

There is some excuse for this in view of the fact that the accumulated knowledge on this subject is found only in medical journals and barely mentioned or else ignored in medical text-books. An idea of the frequency of specific aortitis may be gained from Gruber's[4] statistics of 6000 autopsy records, showing aortic lues in 4 per cent. Marchand[5] in a report on 256 autopsies on bodies with acquired syphilis found aortitic lues in 82 per cent. Marchand states there is no doubt many cases of aortic syphilis are mild invasions and subside without doing much damage. Stadler[6] found syphilis of the aorta in 82 per cent. in 156 cases of syphilis. Obendorfer[7] found in 1436 autopsies on adult bodies that 7 per cent. showed aortic lues and in 40 of these the diagnosis was made by the autopsy findings.

The frequency of the association of specific aortitis and tabes and paresis is a well-known observation. Goldscheider[8] in 136 cases of syphilitic aortitis found tabes in 29—other investigations show aortitis in 30 to 40 per cent. of all cases of tabes and general paresis.

In the routine use of the Wassermann reaction in our office I have found 7 cases of specific aortitis in 136 positive Wassermann or luetin tests, 5.1 per cent. This may be low as no doubt some of our cases of positive Wassermanns in latent syphilis may have been cases of specific aortitis—in which we were not able to make a diagnosis.

PATHOLOGY. Microscopic. Syphilis, as shown by Heller, is an inflammation, with reparative reaction, thus differing with atheroma with its atrophy and decay. The spirochete shows its ravages in all three coats of the arterial wall, the invasion taking place through the vasa vasorum. The adventitia is attacked first, then the media, and these coats bear the brunt of the damage. Collections of lymphoid and plasma cells are found and occasionally giant cells; these occlude the vasæ, with resulting weakening of the middle coat. This yielding of the media shows itself later as saccules, bulgings and aneurysms. The cellular collections may show as nodular masses on the intimal surface. These nodules are miliary gummata, showing a tendency to become necrotic in their centers; this, with later absorption, explain the scars and arterial distortions seen in advanced cases. The spirochetes are found with difficulty in the media. Warthin's[8] work has shown that the spirochete is found

in cardiac and aortitic syphilis much more frequently than hitherto suspected.

The gross lesions are easily understood in the light of the microscopic changes. Irregular folds and roughenings of the intima—translucent and pearly plaques. These cushions or wheals may be yellow in color. The distinction between atheromatous deposits and luetic changes is found in the absence of fat and calcareous deposits. The two conditions are frequently coincident. Syphilis usually attacks the aorta at its orifice, and when the extension is toward the heart the valves and coronaries usually suffer, with disastrous consequences to this organ. However, the extension may be from the heart, and in this group of cases the damage is usually less severe. No portion of the thoracic aorta is exempt. Rarely is the abdominal aorta invaded. The gross pathological picture includes the characteristic wrinkling of the intima—longitudinal rugæ, thinned out and scarred areas. The more advanced stages are shown by small saccules and aneurysms.

Studies of luetic aortitis have given rise to the important question as to why the thoracic aorta should bear the brunt and why the abdominal aorta should escape the spirochetic ravages. This important point has been elucidated by the anatomical researches of Klotz,[9] who has shown that this selective action of the spirochete is due to the rich lymphatic supply of the ascending and transverse portion of the aorta, which by their proximity to the abundant mediastinal lymph glands are invariably infected by retrograde movements of the spirochete. This explanation, no doubt, explains the arterial localizations, but it does not tell us why the spirochete should show a preference for the thoracic lymph glands rather than for the abdominal glandular areas.

Syphilis of the aorta exhibits several types and different localizations, and a working classification of these types is made by Dieulafoy, who makes the following divisions:

1. When the disease is confined to the first portion of the aorta. Suprasigmoid aortitis.
2. Syphilis of the aortic valves with incompetence.
3. Aneurysmal forms.
4. Obliteration of the coronary vessels.

I will not attempt to deal with all these types but will try and justify this paper by discussing only the first type, and that in its early form. We are all familiar with syphilitic aortic incompetency and the aneurysmal types, but I am sure none of us are sufficiently acquainted with the earlier forms of luetic aortitis in which the disease has not advanced to a stage where the gross changes are easily detected and where careful cardiac examination shows no aortic valve lesion. This is the type that is easily missed and where the chance of effective therapy is considerable. I have had seven cases of this type of aortitis which I have been able to diagnose as specific

and will try and show how easy it is to overlook this important clinical condition unless one has it continually in mind when examining any obscure chest case. The symptoms are extremely indefinite and are not clear cut, often not severe enough to alarm the patient, but from the fact that chest symptoms in general are associated in the mind of the laity with tuberculosis, often brings these patients to our offices, with a request for a chest examination. The symptoms of specific aortitis are:

1. Pain. Most frequent symptom. Characteristics:

(*a*) Origin under the sternum, usually at the junction of 1 to 2 portions; or

(*b*) Sense of constriction or compression. This may vary from a feeling of tightness or pressure to the more severe anginal forms; or

(*c*) Radiation into the brachial plexus, with the characteristic arm localization—usually of the left side, rarely of the right side and very rarely both sides.

The etiology of aortitis pain is not definitely settled, but probably due according to Allbutt to the inflammation and irritation of the adventitial coat, which has been shown by Dogrel to have special nerve endings in the connective tissues of the pericardial and adventitial coats of the aorta. Aortitis pain is similar to that in fibrous tissues in general, as acute pleurisy, gout, etc.

2. Indefinite Symptoms:

(*a*) Fatigue. These patients usually are weak, neurasthenic in their complaints, somewhat similar to the group of early tuberculosis; they tire easily. Mental fatigue may be prominent; memory disturbances and headaches are complained of.

(*b*) Dyspnea. This is an important symptom, present in all of my cases. It varies from a mild dyspnea of effort to the more severe types of strident respiration, as in Case III. This symptom, if not associated with pressure signs, is often due to early cardiac insufficiency, which may be luetic.

(*c*) Hoarseness. This is usually associated with pressure of the recurrent laryngeal nerve. In Case III the paralysis was permanent, as was the hoarseness. Pressure on the bronchi may cause respiratory stenosis.

(*d*) Fever. May be present in certain cases. Usually irregular in type. Case IV showed this symptom.

(*e*) Cough. May be present. This is usually dry and unproductive in type.

(*f*) Cyanosis. This is observed in some cases—usually due to pressure on the upper vena cavæ. None of the cases in my series showed this sign. Two cases showed a complexion similar to that seen in chronic nephritis; pale with moderate cachexia.

In the early stages of luetic aortitis any one or more of these symptoms may be present. Usually the symptoms are not clear-cut and not severe. It is easy to understand how the diagnosis of incipi-

ent tuberculosis is made in some of these cases. Two of my series had been diagnosed as pulmonary tuberculosis, one of whom spent four months in a sanitarium. Slight, irregular fever; chest pains, indefinite in type, often diagnosed as pleuritic; hoarseness; dry cough; comprised a group of symptoms that could easily be confused with early tuberculosis.

Signs. The signs found in aortitis are of considerable value and upon which the diagnosis is made with certainty. The normal aorta of a young adult man should measure 5 to 7 cm. in the transverse diameter. At the age of fifty years, 8 cm. Somewhat less in women. In aortitis the aorta is enlarged in both diameters. We depend on the alterations in width and contour to make our diagnosis. This change may be detected by percussion, and this should be done as a routine in every chest examination, from without inward, in the second and third interspaces. An increased aortic width will be detected in many cases. There is a group of cases, however, in which no percussion changes will be noted. The roentgen diagnosis is by far the most satisfactory method for demonstrating changes in the aortic arch. The roentgen rays show that specific aortitis may show either one or more of the following changes in the normal aortic curve:

1. Enlargement of the aortic shadow to the right. This is usually the earliest demonstrable change, as this is the portion of the aorta first involved in the syphilitic process.

2. Enlargement to the left, with obliteration of the normal aortic knob.

3. Enlargement both to right and left. Increased density of the aortic shadow is suggestive, as is also reduction of the aortic pulsation when viewed flouroscopically.

The other signs are of doubtful value and I have had no experience with the majority of them. I may mention a few:

(*a*) Palpation of the aorta in the jugular notch.

(*b*) Elevation of the subclavian artery.

(*c*) Undue mobility of the apex, due to elongation of the aorta.

(*d*) Changes in the aortic second sound, resembling an Algerian drum, described by Potain as bruit de tabourka—a clanging second sound.

Blood-pressure is not elevated, as a rule, or only moderately elevated. This is of some value in ruling out the aortic dilatation of hypertension cases.

The aorta should be examined both fluoroscopically and with plates. The plates should be taken in the upright position and at a distance of from six to seven feet. These seven-foot plates give an accurate size of the heart and aortic shadow. The other important diagnostic finding in luetic aortitis is the presence of a positive Wassermann test—about 75 per cent. of specific aortitis cases show a positive Wassermann reaction and a certain percentage of the

balance will show a typical luetin test. The presence of a positive Wassermann reaction in the absence of any signs of syphilis should direct our attention to the aorta, and in many cases an early aortitis will either be found or suspected and treatment instituted early enough to forestall the more grave sequelæ which are sure to follow. Warthin[8] has shown that the spirochete may be present in the heart, aorta, pancreas and other organs for years without signs or symptoms of their presence. His findings no doubt explain many cases of so-called latent syphilis, with positive Wassermann reactions.

The final important corroborative evidence is the therapeutic test, and when a group of symptoms clear up under a course of mercury and iodides or an injection of salvarsan a suspicious case becomes a diagnostic certainty and treatment is instituted with the assurance of a permanent improvement or perhaps a cure.

TREATMENT. Treatment, however, may be very unsatisfactory and too much reliance should not be placed on this test. Many of the symptoms will disappear or improve. Pain usually responds to treatment, though not invariably. In all of my cases with pain the response was satisfactory and assisted in making the diagnosis. In Case IV this treatment response aided materially, as the signs were slight and diagnosis was doubtful. No diminution in the size of the aorta need be looked for or expected. Checking further progression of the disease is the most to be expected. The therapeutic expectations are better in these early aortitis cases, however, than in the more severe invasions. In aortic valvulitis the prognosis is bad. In my group of cases the treatment has been symptomatically satisfactory. The ultimate outcome will depend on much longer observation.

CASE I.—Woman, aged fifty-five years. Consulted Dr. Hempstead for hoarseness. She had been diagnosed as an advanced case of tuberculosis by several Eastern men. She gave a history of chronic leg sores, loss of weight, chronic hoarseness, chronic cough and substernal tightness on exertion. Sputum examinations negative. Lungs negative. Aortic arch enlarged to the left. Heart negative. Wassermann 4 plus. After three months' treatment with Hg. and iodides all symptoms were relieved, with a gain in weight of 20 pounds. Three years later still well, having gained 34 pounds in weight, with absolutely no chest symptoms whatsoever.

CASE II.—Man, aged fifty-nine years. Comes for bladder trouble. History of luetic infection seven years ago. No treatment. Examination revealed a well-developed case of tabes. Chest examination showed a dilated aorta, especially to the right. No aortic knob present. Heart showed considerable hypertrophy to the left; "horizontal heart." Aortic first sound replaced by a systolic rumble—a suspicious tracheal tug present. Five months later had a very severe anginal attack, the pain radiating to the right shoulder. Irregular weak pulse. Patient died three months later with double

pyonephrosis. Autopsy findings: Large hypertrophied heart. No valve lesions. Aorta large and bulging; no aneurysm. Intima showed linear folds and yellow plaques; wall of aorta very thin in

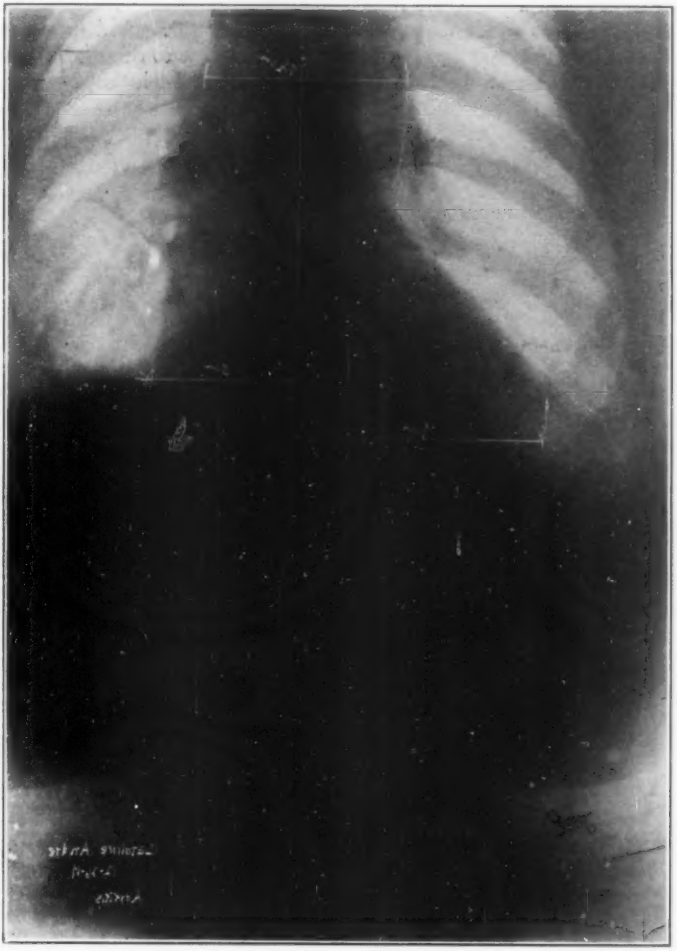

FIG. 1.—Case I. Seven-foot heart plate. Note slight dilatation first portion of aorta and marked in descending portion.

portions. Microscopic examination showed typical picture of moderately early specific aortitis. The lymphoid cells show the characteristic grouping about the bloodvessels in the media.

CASE III.—Man, aged forty-seven years. Comes for hoarseness. He gives a suspicious history of exposure to syphilis twenty-five years ago. Had two and a half years' internal treatment. Ten years ago noticed shortness of breath on exertion and hoarseness. In 1914 had a moderate hemoptysis and was diagnosed as tuberculosis. Was under observation four months, during which time he had no temperature and gave a negative response to the von Pirquet and Morro tests. In 1916 had another attack of hemoptysis and

FIG. 2.—Case II. Seven-foot heart plate. Note horizontal heart; dilatation ascending aorta and descending portions. Autopsy showed dilatation most marked in ascending aorta.

was advised to go to a sanitarium, and was told he had evidences of pulmonary tuberculosis, though he did not cough; had no fever and twenty to thirty sputum examinations were negative. Was discharged in four months as an arrested case. Examination by Dr. Hempstead showed complete left-cord paralysis; no inflammatory reaction. Stereoscopic plates of lungs negative, though a moderately enlarged aortic arch found in a seven-foot heart plate; 7 cm. in broadest diameter. Heart sounds negative. Wassermann test

negative. Lutein showed a fairly typical positive reaction. This case had no substernal pain nor distress, but showed a constant dyspnea and attacks of difficult breathing. A diagnosis of specific aortitis was made. He is still under treatment, and the response has not been marked insofar as the dyspnea and hoarseness are concerned; but the paralysis is, no doubt, due to a permanent degenerative lesion of the recurrent nerve. Not much improvement was expected. His general condition has shown considerable improvement.

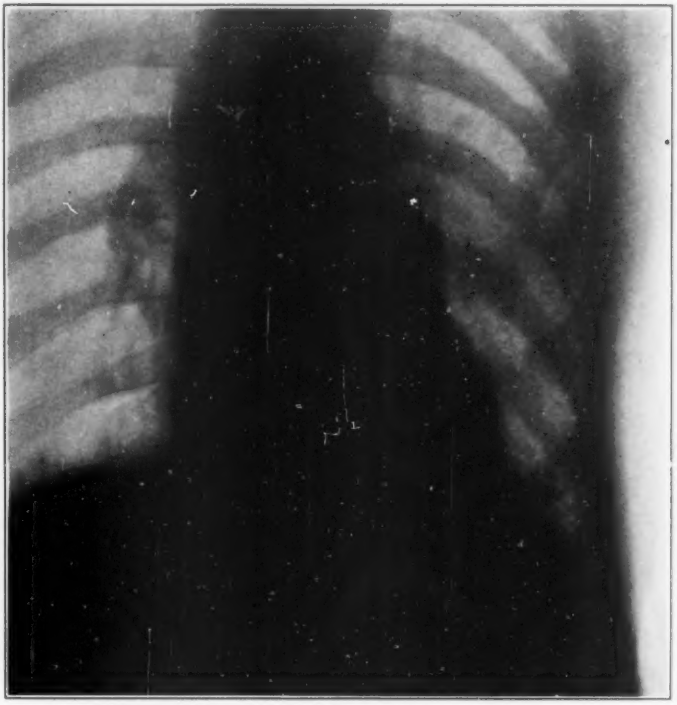

FIG. 3.—Case III. Seven-foot heart plate. Note heart not enlarged. Dilatation and distention; ascending aorta. This case had recurrent nerve paralysis. No aneurysm.

CASE IV.—Woman, aged thirty years. Comes to the office with a previous diagnosis of pneumonia or pleurisy. She gave the history of having had an attack of substernal "tightness" on exertion; pain radiating to the left. Precordial pain on exertion. No cough. Intermittent fever and chilly sensations, marked weakness and some dyspnea. Lung examination negative. Heart not enlarged. Aortic

first sound replaced by rough murmur, transmitted to neck. Stereoscopic chest plates showed lungs negative but an increase of right hilus shadow. No enlargement of the aorta. von Pirquet test negative. Wassermann 4 plus. No history of syphilis obtainable, but it was subsequently learned that her husband had been under treatment for lues within the past year. Diagnosis: syphilitic mediastinitis and aortitis. One dose of salvarsan cleared up all

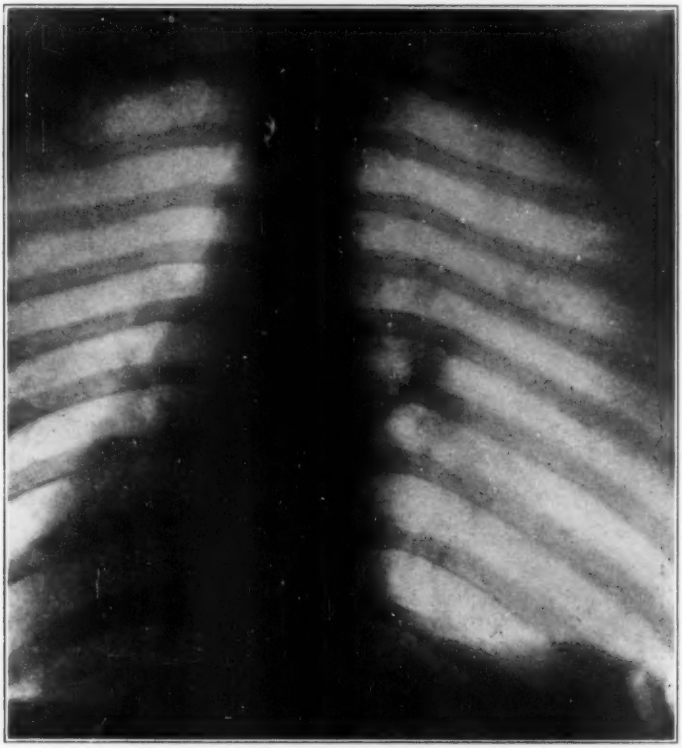

FIG. 4.—Case IV. Seven-foot heart plate. Note no change demonstrable in aorta. Probably aortitis of less than two years' duration.

symptoms and the first aortic sound was audible on subsequent examination. This case is undoubtedly an acute syphilitic aortitis and the negative findings as regarding the aortic shadow are easily understood.

CASE V.—Man, aged thirty-four years. Patient had a specific infection four years previously. Took about 5000 Hg. pills during the course of three years. Three months ago commenced having substernal pain. Worse on exertion. Describes it as a dull burning

sensation. Relieved by large doses of potassium iodides. He was also given three doses of neosalvarsan. He was relieved for three years. He returned last month with a recurrence of chest symptoms, and also stating that while exerting himself he had a terrible precordial pain as if a knife were thrust into the heart. He thought he was going to die; this lasted a few minutes. He still has a precordial

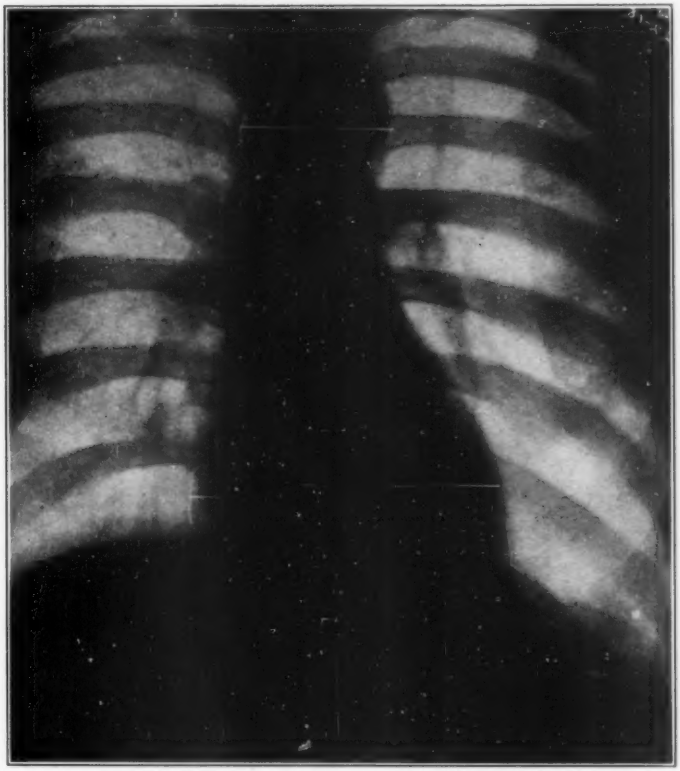

FIG. 5.—Case V. Three-foot heart plate. No change demonstrable in aorta, except slight dilatation of ascending aorta.

soreness. Examination: Head and lungs negative. Heart negative. No enlargement; sounds not abnormal. Seven-foot heart plate shows slight aortic enlargement. Wassermann negative. Lutein test not done as patient could not remain in town. Diagnosis: Luetic aortitis.

CASE VI.—Man, aged fifty-seven years. No history of infection. For the past three years has had indefinite chest pains, worse on

exertion; localization not definite. Several examinations negative; no diagnosis made. Patient described these pains as tight and constricting in type and aggravated by exertion. Past few months have become substernal; would come on in attacks. For the past three weeks has been incapacitated; weakness, dyspnea, and pain were more pronounced. No fever; pulse, negative. Blood-pressure $\frac{150}{85}$. Small obese man. No cyanosis. Some dyspnea. Reflexes

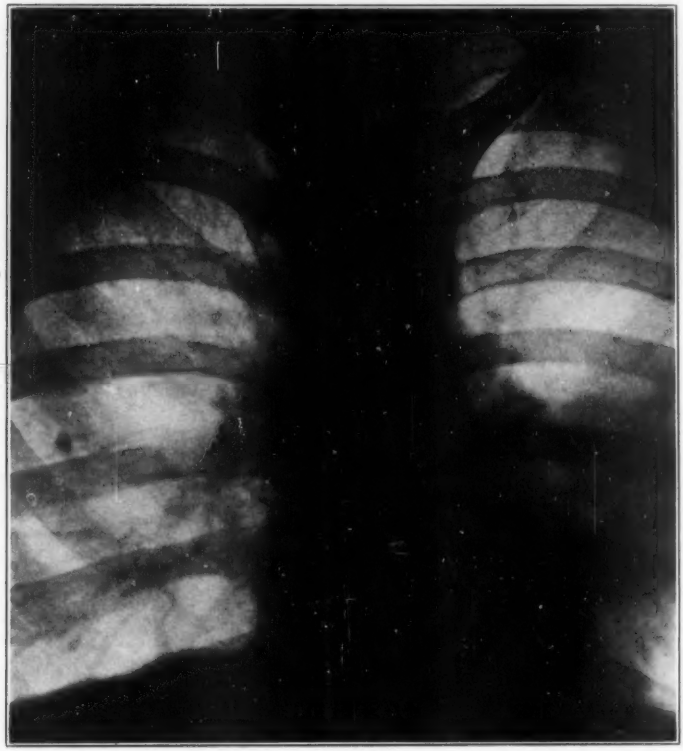

FIG. 6.—Case VI. Three-foot heart plate. No change in aorta. Heart normal size.

normal. Lungs normal. Heart shows systolic aortic murmur. Second aortic loud. Some enlargement to the left. Fluoroscopic examination showed enlargement of arch to right. Irregular contour. Urine negative. Wassermann 4 plus. Patient then admitted a chronic ulceration palmer lesion of three years' duration. Two weeks' treatment with mercury and iodides gave symptomatic relief and he has remained under treatment the past year, with entire relief.

CASE VII.—Man, aged forty-six years. Had primary lesion seven years ago. Treated one year. For the past three years has been going down hill, losing weight. Weakness and obscure chest pains. An examination one year ago was negative, with the exception of a strong positive Wassermann. No treatment was instituted. He again reported to the office several weeks ago, complaining of attacks of dyspnea, precordial pain and substernal distress, with mild pains radiating to both shoulders. No constricting pains. Main complaint is weakness, inability to work and presents the picture of a general breakdown. Examination: Small, haggard looking man; some pallor, general physical examination negative. Heart not enlarged. Aortic first sound impure; second aortic not increased. Stereoscopic lung plates negative; arch not increased in width. Liver not enlarged. Urine negative. Blood-pressure $\frac{100}{60}$. Hg. 85 per cent. Talquist. Diagnosis made of luetic aortitis in spite of negative findings regarding demonstrable changes in the arch. Treatment response was speedy and satisfactory.

RESUMÉ OF CASES. I realize that absolute statements regarding the diagnosis of all these cases cannot be made, as the changes in the aortic contour were not always present. I feel, however, that the diagnosis is justified, with the presence of substernal pain, positive Wassermann and treatment response. I believe these are early amenable cases—the type we should suspect and treat accordingly. In Case IV the probable duration of time from infection to onset of symptoms is hard to estimate, but probably not over two years. This time interval may vary from a few months, as in Brooks's[9] cases, where syphilitic aortitis developed during the roseola, to twenty to thirty years. The longest interval in our cases was twenty-five years and the shortest was less than two years.

CONCLUSIONS. Analysis of these 5 cases show several important points:

1. The frequency with which specific aortitis is confused with pulmonary disease.

2. That specific aortitis is not always a late syphilitic manifestation, as note in Case IV probably six to eight months after infection.

3. That practically all physical signs may be absent and the diagnosis will rest on substernal distress, a positive Wassermann test and the therapeutic test.

4. That a positive Wassermann reaction means syphilis, and even in the absence of all outward manifestations of syphilis the aorta should be suspected and active treatment instituted.

5. That a negative Wassermann test does not rule out specific aortitis and a luetin test should be performed and the effect of treatment should be studied.

6. That aortitis should be diagnosed before the more gross pathological changes have taken place, as when that stage is reached usually treatment is ineffective.

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ADENOCARCINOMA OF THE INTESTINE OF UNUSUAL GENERALIZATION AND WITH PECULIAR CYSTIC METASTASES.[1]

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The following case is recorded because of the unusual generalization and appearance of the metastases in the intestinal tract, which had some resemblance to umatosis cystoides intestini or intestinal gaseous cysts of swine and man and also on account of the difficulty of exactly locating the primary lesion.

Case History. The patient, a Chinaman, worked in a laundry and was well up to four months ago. He smokes opium to excess but does not use alcohol. Ten weeks ago he had a Neisser infection.

The present condition began about four months ago with indefinite pains in his left shoulder, abdomen, back and upper part of the thighs. Later the pain settled in the lumbar region and his abdomen began to swell. For two weeks before admission to the hospital he had a severe cough and expectorated a large amount of dirty, grayish sputum. He states that warm food agrees with him but that cold food causes pain in his stomach. Without medicine his bowels move only every third or fourth day.

[1] Under a grant of the Cooper Fund of Medical Research in McGill University.

On admission, December 18, 1917, pulse was 96, temperature 97° F. and respirations 18. He lies in dorsal decubitus with his knees flexed and has an anxious expression. Conjunctivæ and mucous membranes distinctly icteroid, skin dry and harsh, with very little subcutaneous tissue, and he has evidently lost weight. Examination of the respiratory system showed only harsh, vesicular breathing, with fine crackles over both the interscapular regions.

Cardiovascular System. Negative.

Genito-urinary System. No evidence of Neisser; frequency $\frac{\text{D } 4\text{–}5}{\text{N. } 1.}$

Urinalysis. Amber; turbid; alkaline; specific gravity, 1024. No sugar or albumin; phosphates, carbonates and a few pus cells.

The abdomen is distended and tense, with slight tenderness around the umbilicus. The flanks bulge and are dull on percussion. On palpation an irregular mass can be felt lying transversely across the abdomen above the level of the umbilicus.

December 20 a laparotomy was done and about 1000 c.c. of straw-colored fluid were removed and a specimen was sent for examination. The intestines were found to be studded with nodules and the omentum was rolled up in a mass above the umbilicus. An enlarged, firm gland was removed for examination and the abdomen closed. (This gland was reported as being a metastasis of an adenocarcinoma. See below.)

Following the operation the patient rallied well at first, but later generalized jaundice appeared and he gradually lost weight and died January 21, 1918.

Autopsy was performed four hours after death: The skin shows a deep icteroid tint, the abdomen is markedly distended and contains a large amount of bile-stained fluid. The omentum is thickened, rolled up and extends transversely across the abdomen from the left upper quadrant to the right flank just below the level of the umbilicus. It is studded with numerous small, firm nodules and the lower border consists of a solid, irregular mass of growth. The liver is small, weighing 1280 gm.; the capsule is somewhat thickened and irregularly opaque. On section the cut surface is a dark olive-green color, with indistinct markings. There are several small areas which are yellow and apparently necrotic, with many small, dilated bile ducts in them. There is a stone about the size of a small walnut in the hepatic duct near the gall-bladder. The surrounding tissue is firm, white and partly fibrous. The hepatic ducts are markedly distended. There is a small nodular growth near the cystic duct the size of a small marble. A small pea-sized stone was found in the ampulla of Vater and the gall-bladder was filled with a milky mucoid fluid.

The alimentary tract is particularly interesting. The esophagus is free, the stomach shows several healed ulcers varying in size from a few millimeters to 3 cm. in diameter. Throughout the

intestine, however, there are numerous larger and smaller, sometimes solid, sometimes cystic tumor masses. These can be roughly divided into three classes:

1. Firm, nodular growths, which occur most frequently and are usually situated near or in the mesenteric attachment. They apparently lie immediately beneath the serous coat and appear as round masses with a flattened surface and varying in size from a few millimeters to 1 cm. or more. On section they are small solid masses of whitish-yellow tissue, occasionally with slight honeycombed appearance. Larger, irregular masses occur which seem to be of the same nature and possibly a fusion of several of these nodules. Such a mass occurs in the cecum near the ileocecal valve and in total bulk about the size of a small egg.

2. Beneath the mucous surface of the intestine small spherical masses can be seen which are soft to the touch and cystic, and also vary in size from a few millimeters to over 1 cm. On section they are filled with a thick mucoid material.

3. Several large cysts, projecting into the lumen of the gut, which appear to lie between the serosa and mucosa and covered only by these coats. They are of a bluish color, soft, fluctuating, appear and feel like large emphysematous bullæ and are filled with a whitish, partly gelatinous, partly mucoid material. One of these is situated 57 cm. from the duodenal-jejunal flexure and is about the size of a sparrow egg, and from it sections were taken. Another, slightly smaller, was cut out without being opened and from it Dr. Bruère kindly made a bacteriological report. The largest cyst is situated in the dependent part of the cecum and corresponds in appearance to that already described, but is as big as an egg. In the transverse colon there is another slightly smaller but similar cyst.

The microscopic report on the snipping removed from the omental mass during the exploratory laparotomy on December 19 is as follows:

The sections show a fatty reticular tissue which has been invaded by an adenocarcinomatous growth, which is made up of larger and smaller cystically dilated acini. The smaller and apparently younger acini show a small lumen, a well-formed columnar epithelium sitting on a basement membrane and oval, deeply chromatic nuclei situated near the base. The largest alveoli are filled with a faintly staining, mucoid material. The lining epithelium is, for the most part, missing, or where present is of a low cuboidal type. Between these two extremes intermediate stages can be traced and in many of these glands the epithelium is evidently actively secreting a mucinous material. The tissue also shows a more or less generalized infiltration, with inflammatory cells, mostly of the polymorphonuclear type.

DIAGNOSIS. Metastases of an adenocarcinoma in omental tissue. Sections taken at autopsy from several of the nodules grouped above in Class I show a very uniform picture. The growth is most marked in the serosa, and, as in the case of the omental metastases, is made up of glandular loops, which show varying degrees of cystic dilatation, with progressive destruction of the lining columnar epithelium. The musculature has been invaded and destroyed, leaving only an occasional thin strand of muscle cells and the alveolar structures extend into the submucosa. The slight honeycombed appearance seen grossly is due to the largest of the dilated acini, which are of such a size as to be just visible to the naked eye. The mucous membrane is well defined from the growth, but is very thin and represented by irregular villous projections. The individual cells are in a rather advanced stage of necrosis and atrophy, evidently due to lack of nutrition and pressure.

In Class II the microscopic appearance is somewhat different. The metastatic cells evidently reached the submucosa and there found a suitable soil to grow on. The serosa and muscular coats are here intact and form the outer coats of the cystic mass. Immediately to the inner side of the musculature there is a cystic cavity which is filled with mucoid material. The epithelium has completely disappeared and the wall is formed by connective tissue. Between this cystic space and the mucous membrane the edematous remains of the submucosa can be seen, and in it are a few small, irregular, glandular loops. The mucosa itself is similar to that described in Class I.

The third series of sections are taken from the large emphysematous cysts. The cavity is the size of an egg and the wall is very thin, the contained mucoid material giving it a bluish appearance grossly. The cavity lies between the mucosa and the musculature, its inner surface devoid of epithelium and formed externally by the smooth musculature of the gut wall and the serosa and toward the lumen of the gut by fibrillar connective tissue covered by the remaining necrotic and atrophic mucous membrane.

One of these cysts was excised and examined bacteriologically, and Dr. Bruère isolated (1) a variant of Bacillus communis, which fermented lactose very slowly and feebly to acid and gas; (2) Bacillus coli communis, excretal type.

From the gross and microscopic examination it is evident that the lesion is a widespread metastasis from an adenocarcinomatous growth. The cell type, manner of growth and the character of its secretion all point to its derivation from the intestinal tract, but at the time of autopsy it had become so widespread and so uniform, except for the cystic changes, that the primary growth could not be identified. The metastases in the serosa are most typically adenomatous and, due to the greater resistance of the musculature and connective tissue, the cystic dilatation is well controlled; but

when the metastases reach the loose submucous tissue colloid or mucoid degeneration and distention are the marked feature and typically shown in the group of nodules in Class II. When we come to the four large cysts, which due to their unusual appearance led to this investigation, they are evidently an exaggeration of the mucoid degeneration seen in the second group, with complete destruction of the mucoid secreting epithelium. This can be pretty safely assumed because of the similarity of the cystic contents and the location of the lesion in the submucous coat.

Whether or not the cysts became infected with the gas-forming bacteria long enough before death to partly account for their large size it is impossible to say, but not unlikely. Therefore it appears that these large cysts which grossly were at first thought to be an independent lesion are only a peculiar manifestation of degenerative processes in the original carcinomatous metastases.

The distribution of the metastases is also interesting; they are confined to the gut, peritoneal glands, omentum and the hilus of the liver indicating a dissemination through the peritoneal lymphatics and in this way resembling some cases of tuberculosis.

I wish to express my thanks to Professor Oertel for his kind criticism.

THE VALUE OF VENTRICULAR PUNCTURE FOR THE EARLY DIAGNOSIS AND SERUM TREATMENT OF POSTERIOR BASILAR MENINGITIS.

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The results obtained about a year ago in the treatment of two babies suffering from posterior basilar meningitis who were admitted to the Willard Parker Hospital are of sufficient interest to justify a short discussion of certain features of the disease and a detailed presentation of the clinical and laboratory reports of the cases. In the literature several late cases of posterior basilar meningitis are reported who recovered after ventricular punctures and injections of antimeningitis serum. No particular attention seems, however, to have been drawn in any of the communications to the importance of an early diagnosis before the progressive character of the symptoms had established the diagnosis beyond a doubt, at which time more or less damage to the brain tissue had already taken place.

The difficulty of recognizing the disease in its early stages, the late complication of an internal hydrocephalus and the resulting high

mortality point to the necessity of utilizing all the available early and often slight symptoms, so as to establish an accurate diagnosis and institute prompt serum treatment by means of ventricular puncture. In antimeningitis serum we have an excellent specific remedy for meningococcus meningitis; it must, however, be injected if it is to be fully efficient in the early stages of the disease and into those places where it will be most active.

The pathological anatomy of posterior basilar meningitis shows that the disease is characterized by a yellow fibrinopurulent exudate which fills up the cisterna magna, spreads downward for a variable distance along the posterior aspect of the cord and forward along the base of the brain so far as the interpeduncular space, the optic chiasm and the tips of the temporosphenoidal lobes.

The early symptoms of the disease in infants below six months of age are not very definite and the diagnosis is often difficult to establish. The only symptoms present may be fine tremors of the extremities, temperature 100° to 104° F., and, of special importance, a slight bulging of the anterior fontanelle. The bulging of the fontanelle in an infant who is quiet and breathing regularly should arouse suspicion and lead to a diagnostic lumbar puncture, especially if one or more of the other symptoms are also present. The results of lumbar puncture in cases of posterior basilar meningitis, in which there is generally an exudate covering and closing the foramina of Magendie and Luschka, may be significant in one of several ways: The lumbar puncture may yield (*a*) a dry tap, (*b*) a few drops of clear sterile spinal fluid or (*c*) 1 to 2 c.c. of purulent fluid. This pus represents some of the material which had formed and settled down in the lower part of the spinal canal before the openings between the fourth ventricle and subarachnoid space in the spinal cord became closed by inflammatory exudate. The diagnosis is readily established in the last group of cases by examining the purulent spinal fluid. Very little of this fluid can be withdrawn, however, and little if any of the antimeningitis serum injected. The indications then become very definite for a ventricular puncture, the removal of a larger amount of fluid and the reinjection of a suitable amount of serum.

In the group of cases, however, that show clinically a slight bulging anterior fontanelle, but give a dry tap or a few drops of sterile spinal fluid on lumbar puncture, the diagnosis remains in doubt. We might hesitate before proceeding to the somewhat more radical procedure of a ventricular puncture. It would be, however, a mistake to wait for the development of the more marked symptoms of a progressive meningitis, such as opisthotonos, retraction of the head and internal hydrocephalus. These symptoms represent more extensive and often irreparable damage to the brain tissue. In the presence of a bulging fontanelle a dry tap in the hands of one who is expert in lumbar punctures, especially if it also follows a second or a third attempt,

should be a clear indication for making a ventricular puncture to establish the necessary diagnosis. A true dry tap can almost always be established by leaving the lumbar puncture needle in place, inserting a second needle into the next space higher up (between the third and fourth lumbar vertebræ) and, after waiting to see if any spinal fluid will escape, allowing some sterile saline to flow into one of these needles. The saline solution will escape through the other needle, showing that both needles have been properly inserted into the subarachnoid space of the spinal canal.

If the case has not been properly treated in the early stages of the disease by ventricular punctures and injections of serum a group of symptoms will gradually develop in the course of the next ten to fourteen days, which are very characteristic but indicate that more or less damage has already taken place. There is an increasing rigidity of the neck, retraction of the head and a moderate or marked opisthotonos. The extremities become extended and spastic, the hands pronated and clenched and the legs adducted and at times crossed. In other cases there may be flexion of the limbs at the various joints. The development of hydrocephalus is indicated by tense and bulging open fontanelles. Dilated pupils, strabismus and sometimes blindness are other symptoms that develop in the later stages. Fever and projectile vomiting are present, and finally death takes place, with progressive emaciation, which is quite a feature of the disease. If the infant should recover from the acute stage of the illness it will, as a rule, develop a permanent hydrocephalus, associated with an impairment of one or more of the sense organs.

In adults cases are occasionally seen that require trephining, ventricular puncture and injection of serum. These patients begin with an ordinary attack of cerebrospinal meningitis and are treated by lumbar punctures daily for possibly a week or ten days. The spinal fluid becomes sterile after the second or third lumbar puncture, but it continues more or less turbid. The clinical symptoms persist and become aggravated. If the patient is conscious he complains of intense headache. There is frequently delirium. The pupils are contracted and the fundi show congested or edematous disks. The explanation for this complication lies probably in the fact that the foramina of Magendie and Luschka have become closed by the plastic exudate over the base of the brain while the space between the spinal cord and the foramen magnum has remained clear. This results in a retention of ventricular fluid containing meningococci and a dilatation of the ventricles of the brain, while the cerebrospinal fluid produced in the subarachnoid space passes freely down into the spinal canal and appears by lumbar puncture. The antimeningitis serum injected by lumbar puncture can only reach and sterilize the subarachnoid space of the cerebrospinal axis. To reach the ventricles these patients have to be trephined, the lateral ven-

tricles punctured and the serum injected. The puncture and injection of the serum will have to be repeated several times.

In another group of adult cases the patients have gotten over the most acute symptoms and the spinal fluid has begun to clear up distinctly, when there suddenly begins a rapid aggravation of symptoms and the patients complain of intense headache. The eyegrounds show congested or even edematous disks. The spinal fluid is sterile in culture but slightly turbid. If a ventricular puncture is made the fluid is found distinctly less turbid than the spinal fluid and also sterile in culture. In these cases the acute bacteriological infection has stopped both in the ventricles and in the subarachnoid space of the cerebrospinal axis, but the exudate at the base has gradually closed the foramina of exit from the fourth ventricle and the ventricles in the brain are becoming acutely dilated. Repeated ventricular punctures without the injection of serum are indicated in the treatment of these cases. These punctures are made, according to the method of Kocher, through a small trephine opening 2.5 cm. from the median line and 3 cm. in front of the coronal suture. The needle is passed inward and slightly backward for a distance of about 4 or 5 cm., when the lateral ventricle will be reached.

The differential diagnosis in infants must take into consideration the following diseases:

(*a*) Tubercular meningitis and the different forms of septic meningitis.
(*b*) Meningismus.
(*c*) Pneumonia.
(*d*) Poliomyelitis and polioencephalitis.
(*e*) Meningeal hemorrhage.

DIAGNOSIS. The diagnosis is established by lumbar puncture and the examination of the spinal fluid. If there is a dry tap and the patient shows a bulging fontanelle a ventricular puncture is indicated. In adults the persistence or aggravation of the clinical symptoms and a cloudy but sterile spinal fluid indicate a ventricular puncture.

PROGNOSIS. The prognosis depends to a great extent upon the stage of the disease in which the diagnosis is established and the serum injected into the ventricles. One of the two cases reported in this communication was treated for three weeks with small injections of antimeningitis serum into the spinal canal. The ventricular fluid obtained from the infant at the end of this time showed a great many meningococci, indicating that the spinal injections of the serum had had very little if any effect on the course of the disease. Three ventricular injections of antimeningitis serum, given at intervals of twenty-four hours, produced a sterile fluid, but the disease had progressed too far and the patient finally died, with marked emaciation. The second patient was treated in the early stages of the disease and recovered completely. The prognosis would seem to

depend therefore, to a considerable extent, upon the time when the diagnosis is made and proper treatment instituted.

TREATMENT. The treatment consists of puncture, daily or every other day, of the lateral ventricles, withdrawal of the fluid and reinjection of a suitable amount of antimeningitis serum. The interval between each puncture and the total number of punctures will depend upon the clinical course and the examination of the ventricular fluid. From four to six punctures and injections of serum may be required. The amount of fluid withdrawn from the ventricles varies from 20 to 50 c.c. and the amount of serum injected from 15 to 35 c.c. The treatments are not discontinued as soon as the ventricular fluid is found sterile on culture, but one or two additional serum injections should be given. Cases of meningococcus meningitis are occasionally observed that are not treated sufficiently with serum and subsequently show relapses, as indicated by an increased temperature and reappearance of positive meningococcus cultures in the spinal fluid, even though the latter had for a few days been negative in cultures.

The technic of ventricular puncture is simple but requires certain precautions. The infant should be wrapped in a sheet and placed in the dorsal position, with the head brought near the edge of the table. The area over and around the anterior fontanelle is shaved, if necessary, and sterilized with tincture of iodin. One assistant holds the head of the infant firmly between his hands and another one secures its body. The operator sits at the head of the table. The lumbar puncture needle used in this operation should preferably be not larger than a No. 18 gauge, three inches long and have a short bevelled point (George Tiemann & Co.). The needle is introduced through the anterior fontanelle on a horizontal line connecting the two lateral angles, 1 cm. from the middle line, in order to avoid injuring the longitudinal sinus. It is passed to a depth of from 2 to 5 cm., when the lateral ventricle will be readily reached. The direction of the needle from its insertion through the scalp is almost perpendicular but slightly outward and forward. The needle is held very gently and supported, rather than firmly fixed, between the fingers. The plunger in the needle is removed and the ventricular fluid allowed to escape into a test tube, which is held by an assistant. If the fluid flows out too rapidly its escape may be temporarily stopped by partly reintroducing the plunger into the needle. The small size of the needle will avoid too rapid a removal of the ventricular fluid and injection of serum as well as unnecessary trauma of the brain tissue. After withdrawing the fluid from the ventricle a gravity outfit, consisting of the barrel of a 10 to 20 c.c. syringe and connecting rubber tubing, is attached by an assistant to the needle and the antimeningitis serum, previously warmed to body temperature, is slowly injected. Care should be taken to reinject less fluid than is removed. At the end of the operation the needle is

gently withdrawn and a sterile dressing applied. It is not necessary or advisable to wash out the ventricle with salt solution before the injection of the serum. For repeating the injection it is preferable to use the other ventricle. Each specimen of fluid withdrawn is carefully examined by smears and bacteriological cultures.

The infant should be kept in the hospital under observation for at least four weeks after convalescence has set in. Before discharging the patient a lumbar puncture should be made to see whether a clear spinal fluid can be obtained. This would indicate the reëstablishment of the communication through the foramina of Magendie and Luschka between the ventricular cavities in the brain and the subarachnoid space in the spinal canal.

Every effort should be made to have the breast feeding continued during the patient's stay in the hosiptal. This is an important feature of the treatment, as changing to bottle feeding is likely to greatly diminish the chances of the infant's recovery. After the patient has been discharged from the hospital, observations should be continued for a period of several years to determine any possible impairment of the mentality or of any of the special sense organs.

The following are the records of the two cases treated at the Willard Parker Hospital. The contrast in the final results, due to the institution of proper treatment at different stages of the disease, illustrates quite definitely the necessity of early ventricular puncture for diagnosis and treatment.

Case I.—Frank S. (Chart I). Patient, aged two and a half months, was admitted to the hospital on May 9, 1917. Had been ill for eighteen days previous to admission. The patient presented the typical clinical picture of an advanced basilar meningitis. There was marked retraction of the head, opisthotonos, spasm of the limbs and bulging of the anterior fontanelle. The patient was first seen at home by a physician connected with the meningitis division of the Department of Health. A lumbar puncture was made but it resulted in a dry tap. Two other punctures were made at subsequent visits, but each time only a few drops of sterile bloody fluid were obtained. After admission to the hospital on May 9 (nineteenth day of disease) four more lumbar punctures were made, which again only resulted in a few drops of sterile spinal fluid. At each lumbar puncture a few cubic centimeters of antimeningitis serum were injected intraspinally.

The patient showed no clinical improvement during this time. His condition became rapidly worse; the opisthotonos was more marked, the anterior fontanelle showed greater bulging and the child was becoming progressively more emaciated.

May 15 (twenty-fifth day of disease). First ventricular puncture was made; 45 c.c. turbid fluid obtained, containing numerous meningococci in smears and cultures; 20 c.c. antimeningitis serum injected by gravity.

May 16 (twenty-sixth day of disease). Anterior fontanelle bulging. Second ventricular puncture; 45 c.c. turbid fluid withdrawn, showing several colonies in culture; 20 c.c. antimeningitis serum reinjected.

May 17 (twenty-seventh day of disease). Third ventricular puncture; 40 c.c. slightly cloudy fluid withdrawn, which showed only one colony in culture; 18 c.c. antimeningitis serum reinjected.

May 18 (twenty-eighth day of disease). Fourth ventricular puncture; 10 c.c. slightly cloudy fluid obtained, which was sterile in culture. No serum injected.

May 20 (thirtieth day of disease). Fifth ventricular puncture; 30 c.c. almost clear fluid obtained, which was sterile in culture; 20 c.c. antimeningitis serum reinjected by gravity.

May 21 (thirty-first day of disease). Patient died. Toward the end the patient showed marked marasmus.

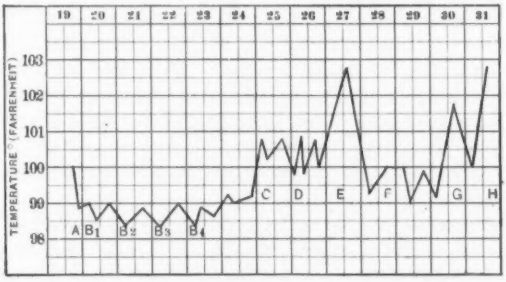

CHART I.—Frank S. (Case I). *A*, lumbar puncture; 15 c.c. blood-tinged fluid withdrawn; *B1*, lumbar puncture; few drops of blood-tinged fluid withdrawn; *B2*, lumbar puncture; few drops of blood-tinged fluid withdrawn; *B3*, lumbar puncture; few drops of blood-tinged fluid withdrawn; *C*, first ventricular puncture; 45 c.c. of turbid fluid withdrawn; 20 c.c. serum; *D*, second ventricular puncture; 45 c.c. of turbid fluid withdrawn; 20 c.c. serum; *E*, third ventricular puncture; 40 c.c. of slightly turbid fluid withdrawn; 18 c.c. serum; *F*, fourth ventricular puncture; 10 c.c. of slightly turbid fluid withdrawn; *G*, fifth ventricular puncture, 30 c.c. almost clear fluid withdrawn; 20 c.c. serum; *H*, patient died.

CASE II.—Giulietta M. (Chart II). Two and a half months old. Admitted to the hospital May 13, 1917. Ill for three days before admission. Symptoms slight and not characteristic. Temperature, 100° F.; occasional tremors of upper and lower extremities; slight but distinct bulging of anterior fontanelle even when the baby was quiet. No rigidity of neck or Kernig's sign. On day of admission a lumbar puncture gave 2 c.c. of purulent fluid containing numerous meningococci in smears and cultures. Several other lumbar punctures were made on the same day and on the following morning but no more spinal fluid could be withdrawn nor could the antimeningitis serum be injected into the spinal canal; 20 c.c. of serum were therefore given subcutaneously on the day of admission.

May 14 (fourth day of disease). First ventricular puncture; 15 c.c. of cloudy fluid withdrawn, which showed numerous meningococci in smears and culture; 10 c.c. serum reinjected.

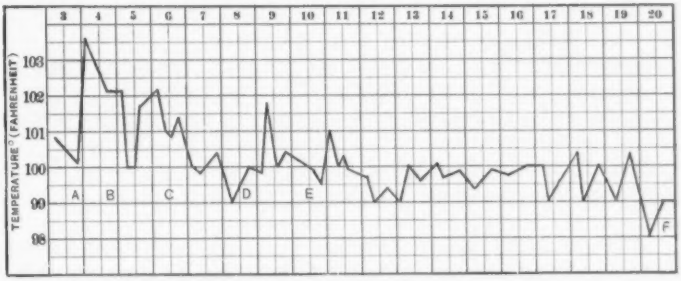

CHART II.—Giulietta M. (Case II). *A*, lumbar puncture; 2 c.c. purulent fluid, containing meningococci; 20 c.c. antimeningitis serum given subcutaneously; *B*, first ventricular puncture; 15 c.c. of turbid fluid withdrawn; 15 c.c. serum injected; *C*, second ventricular puncture; 20 c.c. of turbid fluid withdrawn; 10 c.c. serum injected; *D*, third ventricular puncture; 40 c.c. of turbid fluid withdrawn; 15 c.c. serum injected; *E*, fourth ventricular puncture; 40 c.c. of slightly turbid fluid withdrawn; 20 c.c. serum injected; *F*, lumbar puncture; 10 c.c. of clear spinal fluid, sterile in culture.

FIG. 3.—Giulietta M., three months after the attack.

May 16 (sixth day of disease). Anterior fontanelle bulging; second ventricular puncture made; 20 c.c. turbid fluid obtained, showing a smaller number of meningococci in smears and culture; 10 c.c. serum reinjected.

May 18 (eighth day of disease). Third ventricular puncture; 40 c.c. slightly turbid fluid obtained, sterile in culture; 15 c.c. serum reinjected.

May 20 (tenth day of disease). Fourth ventricular puncture; 40 c.c. slightly turbid fluid withdrawn, which was sterile in culture; 20 c.c. serum reinjected.

May 31 (twenty-first day of disease). Lumbar puncture; 10 c.c. clear spinal fluid obtained, which was sterile in culture. Patient discharged from the hospital.

During the course of the disease the patient developed a slight retraction of the head, which was hardly noticeable, however, at the time of discharge from the institution. The breast feeding was continued during the entire time. It is interesting to note that a nasal culture made on May 16 (sixth day of disease) showed the presence of meningococci.

Fig. 3 was taken three months after the patient was discharged from the hospital. The examination at that time showed that the baby was apparently normal and had made a complete recovery.

A second reëxamination of the patient was recently made (one year after the attack) and the baby was found to be apparently normal and to have made the usual progress in its mental and physical development.

SUMMARY AND CONCLUSIONS. 1. A prompt ventricular puncture is indicated in cases that show progressive meningeal symptoms and give a dry tap on lumbar puncture. In some patients the lumbar puncture may show a few drops of purulent spinal fluid, but a sufficient amount cannot be withdrawn, even by aspiration, with a syringe, and little or no antimeningitis serum can be injected.

2. Even less pronounced meningeal symptoms, such as slight but definite bulging of the anterior fontanelle, tremors of the extremities and fever should lead to a ventricular puncture in cases that have given repeated dry taps in the hands of an experienced operator. Such early ventricular punctures are of vital importance in the successful treatment of cases of posterior basilar meningitis.

3. In adults the persistence or aggravation of the clinical symptoms, associated with a persistently cloudy spinal fluid, which has become sterile after two or three injections of antimeningitis serum, indicate in many cases the necessity for a ventricular puncture. In these patients the lumbar puncture may show a sufficient amount of spinal fluid, but the outlet from the ventricles is closed off and the serum injected into the spinal canal does not reach these infected regions.

4. Ventricular punctures should be repeated daily or every other

day; 20 to 50 c.c. of fluid are withdrawn and 15 to 30 c.c. of serum injected by gravity. The serum should be warmed to body temperature and a smaller amount always reinjected than the amount of fluid withdrawn. Three assistants are generally necessary to carry out the operation carefully and safely.

5. The interval of time between the punctures and the total number of punctures will depend upon the rapidity in the reaccumulation of the fluid, as indicated clinically by the reappearance of a bulging anterior fontanelle and upon the result of the bacteriological culture of the ventricular fluid.

6. A lumbar puncture should be made at the time the patient is discharged from the hospital in order to determine the reëstablishment of the communication between the ventricular cavities in the brain and the subdural space in the spinal canal.

7. If the baby is breast-fed every effort should be made to have the breast feeding continued while the patient remains in the hospital.

8. Occasionally the diagnosis may be assisted in cases giving a dry tap, and before deciding upon a ventricular puncture, by making a culture of the nasal discharge and finding the meningococcus present.

9. Cases of posterior basilar meningitis should be followed up for a period of years to determine the final outcome in those who recover after ventricular punctures and injections of antimeningitis serum.

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PRIMARY CARCINOMA OF THE GALL-BLADDER: AN ANALYSIS OF TWENTY-THREE PROVED INSTANCES OF THE DISEASE.[1]

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In the series of 1000 operatively and pathologically demonstrated instances of gall-bladder disease which I reviewed a year

[1] Read at the Twenty-third Annual Meeting of the American Gastro-enterological Association, Atlantic City, N. J., May 6 and 7, 1918.

since,[2] there occurred 31 cases of malignancy (3.1 per cent.). Of these gall-bladders the neoplasm was primary in 23. In the remaining 8 cases the gall-bladder was secondarily invaded by extension of malignancy from adjacent viscera. There occurred no instance of primary neoplasm of the bile ducts. It is thus evident that of a large series, including gall-bladder affections of nearly every type, primary malignancy arose in 2.3 per cent. The practical value of this rate of the incidence of gall-bladder neoplasms is indicated by the observation that it is more than four times the frequency of primary malignancy of the appendix, and that of neoplasms involving the organs concerned with digestion the gall-bladder is involved fifth in frequency (1 of stomach; 2 of colon and cecum; 3 of rectum; 4 of esophagus; 5 of gall-bladder; 6 of liver; 7 of appendix).

It is frequently stated that the diagnosis of primary malignant disease of the gall-bladder is not difficult. This statement holds true for instances in which there is extensive involvement when pronounced general constitutional upset has occurred and in which the prognosis is evident to even a layman. That there are actual difficulties concerned with the accurate diagnosis of primary neoplasm of the gall-bladder is proved by the fact that of the 23 cases in my series in but 7 instances (30.4 per cent.) was the unqualified, prelaparotomy diagnosis correctly made and recorded in the histories and operation cards. In no case in which early well-localized gall-bladder malignancy existed was there a correct preoperative diagnosis. It would seem, consequently, that the clinical diagnosis of curable neoplasm of the gall-bladder occupies a status relatively similar to that of the clinical diagnosis of early curable primary gastric malignancy.

On account of the foregoing observations it is considered that a clinical analysis of the 23 instances of primary gall-bladder malignancy included in my series of established gall-bladder disease will not be altogether valueless.

Sex. It is commonly recorded that females are affected approximately three times as frequently with malignant disease of the gall-bladder as are males. (Musser, Zenker, Siegert, Mayo, Moynihan and others.) From this observation it is usually deduced that because the incidence of gall-stones in females is about three times that in the male, gall-stones must of necessity be the cause of gall-bladder neoplasms. In spite of many successful experiments in the production of gall-stones there is no instance on record in which the deliberate experimental production of the calculi nor the accidental arising of such a consequence of foreign body (ligatures, drains, etc.), resulted in malignant disease, and this in spite of the fact that the so-called "irritant" has lain even for years in a pre-

[2] Smithies, Frank: Proceedings of the Section in Medicine, American Medical Association, New York Session, June 7, 1917.

viously healthy or diseased gall-bladder. (Homans, Jacques, Meyer, Mignot.)

In our series of primary malignancy of the gall-bladder there were 16 males and 7 females.

AGE. The average for my series was for both sexes 59 years. The minimum age in males was 44 years, the maximum 76 years (average 57.9 years). In females the minimum age was 56 years and the maximum 72 years (average 62.2 years). It would seem that in spite of the greater prevalence of gall-stones in the female the average age at which malignant disease of the gall-bladder occurs is more than five years later than in the male.

HEREDITY. There was only one patient of the series in whom a definite blood relationship of malignancy could be elicited. In another patient the husband had died about a year previously from cancer of the stomach.

DURATION OF SYMPTOMS. In the 100 cases of cancer of the gall-bladder which Musser[3] collected from various non-related sources and from the literature in 1889 the average duration of the ailment is stated as six and two-third months, with a minimum duration of seven weeks and a maximum of four years. It is quite evident when one analyzes cases that in numerous instances the patient has been affected with a gall-bladder dyspepsia of two distinctly definite types, viz.: (*a*) a clinical form, not that commonly considered malignant, and (*b*) a terminal complaint frequently evidencing such serious local and constitutional disturbances as to render a suspicion of some malignant process highly probable. There were in my series 16 cases (69 per cent.) in which a previously harmless type of gall-bladder dyspepsia had been followed by an alarming complaint. In the early period the ailment was commonly intermittently manifested and extended in the average over 9.6 years (minimum 3 years; maximum 36 years). The terminal phase of the disease was one of continuous malfunction (often, clinically, on the part of the gall-bladder) and in duration averaged 10.3 months (minimum 5 weeks, maximum 3 years).

Of the 7 cases in which from its inception the affection had been of an obstinate and progressive type the duration averaged 3.4 months, (minimum 6 weeks, maximum 6 months).

It would seem that consideration of these two types of dyspepsia ultimately proved to be associated with malignant disease of the gall-bladder might furnish more than a clinical hint relative to the nature of the ailment and might also throw considerable light, etiologically, upon the relationship existing between chronic gall-bladder irritation (infective, chemical, foreign body, *e. g.*, calculi) and gall-bladder irritation. It should be here emphasized that chonicity, histologically speaking, must be differentiated from

[3] Boston Med. and Surg. Jour., December 5, 1889, No. 23, cxxi, 553.

chronicity, indicating months or years' duration of disease: a powerful continuously acting stimulus may be quite capable of producing histological changes of malignancy quite as marked as those occurring when an intermittently acting or weakened agent has been manifest over a long period of time.

SYMPTOMATOLOGY. In 17 patients the early history of the affection indicated rare or frequent attacks of such dyspepsia as is commonly associated with catarrhal cholecystitis or cholelithiasis. Not rarely these attacks had borne definite relationship to an acute infectious disease. The history of typhoid fever was obtained from 12 patients—pneumonia from 3 and malaria from 1. At the time of their coming to the hospital, in 20 instances the patients were affected with a continuous and disabling ailment. The characteristics of this ailment now will be considered.

APPETITE. In 14 patients (60.8 per cent.) there was persistent anorexia. The food desire was lessened in 5, but well maintained and in nowise abnormal in 4.

WEIGHT LOSS. There was but one patient who had maintained normal weight. In this case early exploration to relieve distressing gall-bladder dyspepsia disclosed small sessile papilloma. In the remaining 22 cases of my series, weight loss, generally associated with physical weakness, averaged 28 pounds (minimum 15 pounds, maximum 60 pounds). The weight loss was frequently astonishingly rapid, and of itself when taken in connection with an ailment clinically dependent upon gall-bladder malfunction should have furnished a significant hint relative to the development of neoplasm. In three months one patient lost 40 pounds, another 60 pounds in seven months and a third 28 pounds in five weeks. It was not unusual for persistent weight loss associated with unaccountable anorexia weakness or diarrhea to cause alarm a considerable time before symptoms or signs of gall-bladder anomaly presented. Five patients came for the examination at which malignancy was discovered on account of the persistent and puzzling loss of weight.

BOWELS. In 11 cases distressing constipation was recorded; in 4 stools of normal frequency, while 8 patients were subject to diarrhea not rarely uncontrolled by diet and commonly exhausting. Nocturnal diarrhea, with disturbance of sleep and rest, seemed to be an important influence in causing rapid weight loss and cachexia. This was especially noticeable when the gall-bladder malignancy had invaded the pancreas (6 cases).

STOOLS. There were no abnormal findings in 8 instances. The stools of the remaining 15 patients persistently or intermittently indicated interference with free bile flow. They were definitely acholic in 9 cases.

BILE PIGMENT IN THE URINE. Bile pigment in the urine as shown grossly by dark sherry-colored urine, capped with thick green brown or olive froth or by chemical test, was present in 11 instances.

The urine analyses of 5 patients returned report "suspicious" for bile coloring.

(*g*) JAUNDICE. This was definitely manifested by 14 patients. In 3 patients the jaundice was intermittently present. In 11 patients the jaundice was persistent. In these cases the skin coloration and the sclerotic tinting ranged from lively greenish-brown to a muddy or dusky olive green. Itching of the skin or distressing anal pruritus was obstinate in 7 of the continuously jaundiced patients. Such itching was often of significant importance with respect to loss of sleep and rapidly developing weakness.

(*h*) FEVER. Although Musser concludes that in malignancy of the gall-bladder the temperature is liable to be subnormal, rise in temperature with or without chilly sensations or sweats was recorded in 5 patients of my series. Its character was similar to that of cachectic processes associated with malignancy in general or with such exhausting ailment as progressive tuberculosis, viz., a subnormal morning temperature with a rise toward evening or upon unwonted physical or mental exertion. The maximum temperature recorded was 102.3°. In one instance of indefinite upper abdominal nodular tumor not associated with jaundice or pain, the character and persistence of the fever led to a preoperative diagnosis of tuberculosis of the peritoneum. In the presence of ascites, such mistake in diagnosis is not easily avoided unless there be careful scrutiny of the patient's history previous to the period of his presenting complaint.

PAIN. Some degree of abdominal discomfort was experienced by 21 patients (91.2 per cent.). There was severe pain in 16 cases (69 per cent.). In 5 cases sharp, prostating colic-like attacks of pain required opiate relief. In 2 patients the character of the pain suggested gall-bladder perforation.

The abdominal distress was *continuous* in 14 cases but only *intermittently* manifested in 7. It was not unusual to note aggravations of pain, even of colic-like degree, in those patients in whom a continuous abdominal discomfort had been experienced.

Location of Distress. Eleven patients complained of general epigastric pain; in 5 discomfort was definitely confined to the right upper abdominal quadrant, in 1 each distress at the right costal arch, the region of the navel and the xiphoid. In 2 instances there was generalized liver region pain, with a point of intensity below the tip of the right scapula.

Transmission of Pain. There was persistently referred pain in 14 cases. In the order of frequency, pain transmission occurred to the right back, the right shoulder, the tenth to twelfth dorsal vertebræ and the midepigastrium. Distress at the referred point was not infrequently more annoying than was that experienced at the zone of pain inception.

Time of Pain. Maximum distress was commonly recorded as occurring shortly after the taking of food, upon sudden changes of position or after jolting or jarring (*e. g.*, after a rise over a rough road). Only 2 patients complained of severe night pains.

Relief of Pain. In 8 instances opiates were required to make the patient comfortable. Fasting, vomiting, free catharsis, gastric lavage or the administration of alkalies were commonly helpful agents.

ABDOMINAL TENDERNESS. This was recorded in 22 of the 23 cases. It was usually in the right upper quadrant or in the epigastrium generally. In 7 instances the tenderness was so exquisite as to suggest gall-bladder perforation with protectine peritonitis.

ABDOMINAL TUMOR. Such was definitely determined or indefinitely delimited in 17 cases (74 per cent.). The tumor or ridge commonly occupied the right upper abdomen. In 4 cases it extended well across the epigastrium. In size the tumor ranged from a finger-like ridge to an oval or pear-shaped mass as large as a grapefruit. Its *consistency* was commonly firm, although in 3 instances there was a cystic feel, with a suggestion of fluctuation. Its *surface* was definitely rough or nodular in 9 cases. The tumor was *movable* on respiration or change of position in 4 instances. In the remainder the mass seemed deeply fixed. *Tenderness* over the tumor was noted in 12 patients.

ENLARGEMENT OF THE LIVER. Enlargement of the liver occurred in 11 patients (46 per cent.) of the entire series and in 8 cases (47 per cent.), in which abdominal tumor was coincident. In degree the liver enlargement ranged from the organ's being just palpable to its extension downward as much as $5\frac{1}{2}$ inches below the right costal limit. Of the 11 patients in whom the liver was enlarged there was palpable hepatic nodulation in 4. The liver consistency was commonly very firm: in fact, so firm as to suggest the diagnosis of interstitial cirrhosis. Two patients were brought under observation with such previous diagnosis. In 1 case there was concomitant splenic enlargement.

ASCITES. This was demonstrated in 3 patients (13 per cent.) before laparotomy. In 2 other patients free abdominal transudate was discovered at operation (ascites 21.7 per cent., for the series). Pressure upon or actual malignant invasion of the portal vein or its radicles commonly produced the ascites. In 1 instance there was involvement of the receptaculum chyli and the thoracic duct with a resultant chylous ascites.

BELCHING AND NAUSEA. Belching and nausea were annoying in 17 patients. With these symptoms a distressing sensation of upper abdominal "crowding" or "up pressure," particularly at night or after eating, was sufficiently uncomfortable to prevent adequate feeding or uninterrupted sleep.

VOMITING. This occurred either as a daily or an irregular event in 18 patients (79 per cent.). Vomiting of retained food was observed in 10 patients. The vomitus of 13 patients was persistently bile-stained. In 3 cases in which obstruction occurred near the papilla of Vater the vomitus was persistently colored with muddy brown bile. In these cases the gastric extracts grossly suggested those commonly to extensive malignant stenosis of the pyloric end of the stomach.

TEST-MEALS. Data is available in 12 cases. Persistent twelve-hour food retention existed in 5 cases. The *average free HCl* was 21 (minimum 4, maximum 56). There were 6 instances of achlorhydria. The *average total acidity* was 30.1 (minimum 4, maximum 64). *Chemical test* for blood pigment was positive in the gastric extracts from 6 patients. *Lactic acid* was recorded in 5 cases.

Microscopically. Yeasts were in excess in 5 cases and *sarcinæ* coincident in 4. Organism of the Boas-Oppler type were present in 3 of the achlorhydria gastric contents where there was associated food stagnation.

ROENTGEN FINDINGS. There were 11 cases in which roentgen examination had been made before laparotomy. In 5 cases roentgen-ray plates demonstrated atypical shadows in the gall-bladder zone strongly suspicious for calculi. In 3 cases there was interference with the emptying of the stomach, the barium meal remaining longer than six hours in the gastric cavity. In 1 case there was a filling defect at the outlet of the stomach, which, interpreted in the light of the clinical symptomatology and the test-meal examinations, appeared to result from pyloric cancer. At fluoroscopy, the roentgen examination not rarely proved of service in demonstrating that the palpable abdominal tumor lay outside the stomach or other portions of the alimentary tract. There was 1 instance in which the malignant gall-bladder involved the hepatic flexure of the colon. In this case there was not only a colon filling defect but also marked retardation in the progress of colon contents caudad.

OPERATIVE FINDINGS. 1. *The Neoplasm.* In 4 cases the malignant change was well defined and located in the fundus or body of the gall-bladder. In 2 cases there were malignant papillomata. In the remaining 17 cases there was extensive neoplastic involvement of the entire gall-bladder, with contiguous invasion of adjacent viscera.

2. *Histologically* the lesion was constantly carcinoma of the columnar or spheroidal cell type.

3. CONCOMITANT INCIDENCE OF GALL-STONES. Of the 23 instances of primary malignancy of the gall-bladder, cholelithiasis was an associate finding in 16 patients (69 per cent.). In the remaining 7 patients it was not possible to prove the previous presence of gall-stones, although in 4 cases the early histories suggested such. The relationship of cholelithiasis to malignant disease has already been commented upon. It would appear that the fact that gall-stones are often found

in malignant gall-bladders furnishes evidence worthy of note with respect to the gall-stones acting as sources of irritation and the production of malignant hyperplasia of the gall-bladder mucosa. It is not impossible, however, that in malignant gall-bladders calculi may form as a consequence of cancerous change altering the excretory function of the gall-bladder mucosa or preventing proper emptying of the viscus. From the clinical histories of many patients who later on are shown to have malignant disease of the gall-bladder, attacks simulating gall-stones can be elicited at a time previous to the more recent ailment which is apparently clinically malignant. It would certainly seem that in patients in whom gall-stones can be proved to exist, from the clinical or special examinations, their early removal, together with the gall-bladder, might be a considerable factor in preventing malignancy in the individual and also in the human family.

4. Involvement of Adjacent Viscera. In 11 cases the lymph nodes showed metastases; in 8 cases the liver was extensively invaded; in 6 the pancreas; in 2 the stomach and in 1 case each there was extension to the omentum, the hepatic flexure of the colon and the retroperitoneal lymph tissue.

Operative Procedure. In 11 patients abdominal exploration only was possible on account of extensive malignancy. In 4 cases cholecystectomy was performed and once posterior gastro-enterostomy for the relief of pyloric obstruction. In the remaining 7 patients the gall-bladder was drained.

Result. Two patients recovered and have remained well longer than four years. Fatal termination followed in the remainder either shortly after operation or within eight months subsequent to leaving the hospital.

THE RELATION OF PAIN IN GASTRIC AND DUODENAL ULCER TO MUSCULAR ACTIVITY OF THE STOMACH.

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Since the discovery by Boldireff of the presence of contractions in the empty stomach and the demonstration by Cannon that these contractions represent the so-called "hunger pangs," the subject of the activity of the fasting stomach has been most thoroughly worked out by Carlson[1] and his associates both for man and animals. The earlier work of Carlson indicated that the sensory evidence of these contractions, carried by way of the vagus

[1] The Control of Hunger in Health and Disease, Chicago, 1916.

system, originated in the contractions themselves, and the suggestion was made that the pain of gastric and duodenal ulcers might originate through this mechanism.

A number of investigations, notably by Ginsburg, Tumpowski and Hamburger[2] and by Carlson,[3] have demonstrated that the pain in a number of cases of peptic ulcer was in fact rhythmic and that the patient's record of his accessions of pain corresponded to the graphic demonstration of typical hunger contractions. The published tracings of these researches are very convincing, but in taking many histories in ulcer cases one is obliged to note that while accessions of pain are sometimes found to have a rhythmic character, often one finds that the story of pain is continuous and that no interruption or rhythmicity can be read into it. Indeed, the only cases which, for one reason or another, we were able to study at the hospital during the winter of 1916–17 were of this character. The results in this short series, therefore, without controverting the findings of others, seem to show that pain in patients suffering from proved, active, gastric and duodenal ulcers is not of necessity associated with any recognizable activity of the gastric walls and that intense gastric activity can occur in these same patients without giving rise to pain.

The method of study was that of Carlson: the use of a soft, thin-walled rubber bag, readily swallowed and connected to a water manometer of great delicacy by a fine, soft rubber tube. The float of the manometer was made to write without the interposition of a lever upon the slow kymograph. The patient indicated painful sensations by an electric signal. Before the work on ulcer patients was undertaken a year's work on dogs and a study of other human cases had made the method thoroughly familiar.

Case I.—P. B. Surgical 5941. Aged sixty years. Acute gastric ulcer. Symptoms of only twenty days' duration previous to these observations.

Previous History. Unimportant. No previous gastro-intestinal symptoms noted.

Present Illness. Twenty days before the patient began to have high epigastric pain coming on one-half to one hour after eating. At times the same pain comes at night. It is severe, dull, continuous and felt often as a radiation into the right chest and back. Vomiting, at irregular intervals, of coffee-ground material. No retained food. Slight relief from vomiting, but, on the whole, pain is nearly continuous, with short, slight food relief.

Physical Examination. Somewhat emaciated man, drowsy and in pain. Questionable mass in epigastrium.

[2] Contributions to the Physiology of the Stomach XXXV: The Newer Interpretation of Gastric Pain in Ulcer, Jour. Am. Med. Assn., 1916, lxvii, 990.

[3] The Origin of the Epigastric Pain in Cases of Gastric and Duodenal Ulcer, Am. Jour. Physiol., 1917, xlv, 81.

Gastric Analysis. Fasting contents, 50 c.c. Free HCl, 25 c.c. Total acidity, 46 c.c. Test meal: at end of forty minutes: Free HCl, 76 c.c.; total acidity, 44 c.c. At end of eighty minutes: Free HCl, 26 c.c.; total acidity, 40 c.c. At end of 120 minutes: Free HCl, 14 c.c.; total acidity, 34 c.c. Last two specimens bile-stained. Evidently continuous acidity.

Roentgen Study. Large smooth defect in posterior gastric wall just below the lesser curvature, half-way from the pylorus to the cardia. No stasis.

Motility Study I. December 19, 1916. Sixteen hours after eating. Observation for one and one-half hours. Continuous slight epigastric pain of the kind usual to the patient. Low tonus, with slight variations, but no contractions.

FIG. 1.—Case I. Gastric ulcer. Onset of pain is indicated by cessation of time marker. Digestion peristalsis of low grade is shown. Diminution rather than increase of this peristalsis with onset of pain. Low tonus. Base line should be about 1.5 cm. above time marking line. Five-second marking.

Motility Study II. December 20. Two hours after eating. Observation for one and three-quarter hours. Comfortable for three-quarter hour. Moderate gastric tonus with some evidence of short digestive rhythm. Some epigastric pain ushered in by a painful period of about fifteen seconds, followed by a free interval of thirty seconds. After this pain was continuous. No contractions or notable variation in tonus for one hour (Fig. 1). The pain signal was given by interrupting the time-marking apparatus. Base line not indicated. (It should have been about 1.5 cm. above the time line.)

At operation a penetrating ulcer just below the lesser curvature

in the mid-stomach was found. It was adherent to the pancreas, was unhealed and surrounded by a narrow inflammatory zone.

Summary of Case I. Acute gastric ulcer. Study made on fasting stomach shows habitual slight pain without contractions. Study made after eating shows severe pain accompanied by low tonus without contractions.

CASE II.—W. C. C. Aged twenty-eight years. Surgical 5992. Chronic gastric ulcer. Symptoms of twelve years' duration.

Previous History. Unimportant.

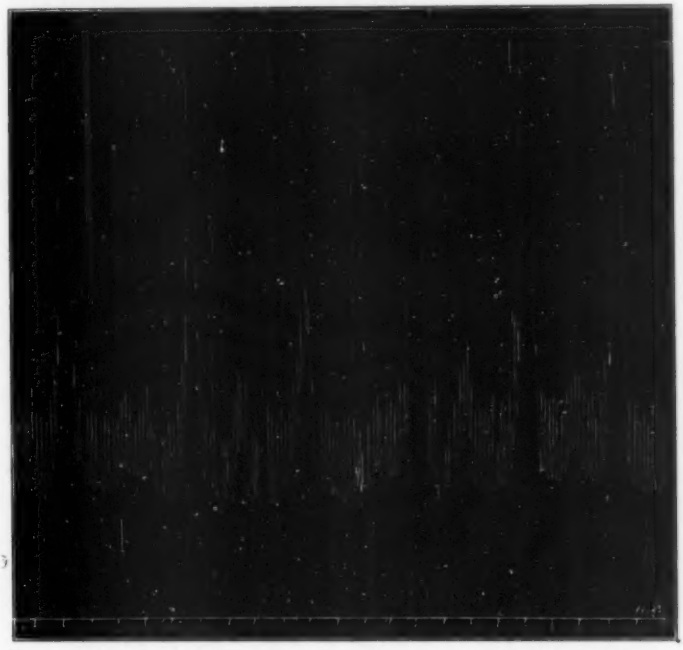

FIG. 2.—Case II. Gastric ulcer. Vigorous hunger contractions (empty stomach) without pain. Oscillation at x is due to a cough. Half-minute marking.

Present Illness. Beginning twelve years ago, distress and "weakening feeling" coming on after meals, with pain in the lower abdomen coming on early after meals or in one or two hours. Typical remissions (one of eighteen months). For five years, dull, grinding epigastric pain at night. Sour eructations. Relief from vomiting, soda and passing of gas by the rectum. Pain now situated a little above the umbilicus and radiates to sides and back.

Physical Examination. Unimportant.

Gastric Analysis. Fasting contents: Eight to ten drops, showing free HCl (not titrated), benzidine +++. Test meal: At the end of forty minutes: Free acid, 29 c.c.; total acidity, 50 c.c. At the end of 120 minutes: Free acid, 54 c.c.; total acidity, 72 c.c. At the end of 160 minutes: Free acid, 60 c.c.; total acidity, 76 c.c. Increasing acidity for nearly three hours after test meal. Continuous acidity.

Roentgen Study. Deep niche in lesser curvature. Slightly hypotonic dilated stomach. Pylorus and duodenum negative. Emptying in four hours.

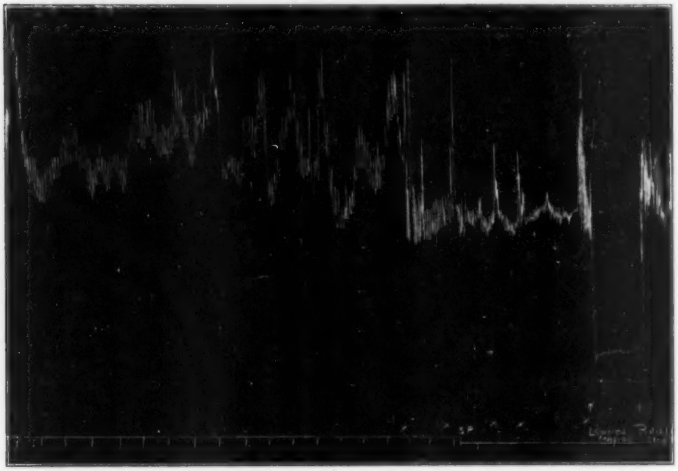

FIG. 3.—Case II. Gastric ulcer. Same day as Fig. 2, but after eating full meal. Note vigorous digestion peristalsis up to point marked *S. P.* Here severe pain suddenly began. At point *x* patient made sudden movements, interrupting otherwise nearly level record. Note diminution of respiratory excursion after onset of pain. Tension of balloon lowered and again raised without altering pain. Half-minute marking.

Motility Study I. December 27, 1916. Fourteen hours after eating. Observation for three hours. Typical hunger contractions, of which Fig. 2 gives an adequate idea. They occurred in two periods, were unusually vigorous and were not accompanied by any pain whatsoever nor by any sensation by which the patient could recognize them.

Motility Study II. December 27. Same day as the preceding study. Two hours after a hearty meat dinner (12.30 P.M.). Swallowed bag at 2.15 P.M. Observation for three hours. Until 4 P.M., *i. e.*, three hours after eating, tracings showed digestion peristalsis (twenty second rhythm of variable intensity), with fairly high tonus, and no pain was noted. Patient asleep, lying on left side, until

pain began at about 4 P.M. and waked patient up. It was of the usual dull, grinding character and caused the patient to writhe, interrupting diaphragmatic breathing, as shown by the diminished respiratory excursions of the manometer needle. Aside from small oscillations, due to body movements, the indicator recorded no gastric activity. On turning the patient upon his right side, the pain ceased in ten minutes, recurred again for a brief period, and as it disappeared the patient passed gas freely by the rectum and gastric motility returned (Fig. 3).

Operation. January 3, 1917. An open penetrating ulcer near the lesser curvature was found. Considerable area of induration about it. Adherent to pancreas. Excision of ulcer. Posterior gastro-jejunostomy.

Motility Study III. January 17 (two weeks after operation). Fourteen hours after eating. Tracings show high tonus, well-marked digestive rhythm (twenty-second contractions), which gradually developed into rather irregular hunger contractions in the course of two hours.

Summary of Case II. Chronic gastric ulcer. Powerful gastric contractions in stomach without pain. Pain after eating, coming on during a period of active digestion peristalsis, with cessation of this peristalsis during the painful period. Cessation of pain on turning the patient from the left to the right side, followed by gradual resumption of digestion peristalsis.

CASE III.—C. W. S. Aged forty-three years. Surgical 6521. Chronic duodenal ulcer. Symptoms of eighteen years' duration.

Previous History. Unimportant.

Present Illness. Typical, twice a year, the periods of pain coming on regularly about three hours after eating. Pain in the nature of a severe soreness, as of "something squeezing by raw surface;" it always was felt under the edge of the ribs on the right. Marked night pain. Clean-cut food and soda gave relief.

Physical Examination. Unimportant.

Gastric Analysis. Fasting contents, 40 c.c.: Free HCl, 60 c.c. Total acidity, 78 c.c. Test meal (three forty-minute periods). On first two periods duodenal contents obtained. (No free HCl.) At the end of the third period 135 c.c. were obtained during the withdrawal of the tube. Free HCl, 70 c.c.; total acidity, 80 c.c. Apparently continuous high acidity.

Roentgen Study. Permanent irregularity of the first portion of the duodenum. Hypertonic stomach.

Motility Study I. March 31, 1917. Eight hours after eating. After swallowing the bag the patient lay on the right side and the pain began in several short periods, soon becoming continuous. During this time the gastric tonus was low and there were no contractions. When turned on the left side the pain ceased and hunger contractions began. During the period of strong hunger

contractions which followed the patient experienced one painful sensation (Fig. 4) in association with an unusually weak contraction. When turned again upon his right side the contractions ceased and after one or two painful sensations steady pain set in. During the onset and establishment of pain there were no contractions and gastric tonus was very low (Fig. 4).

Operation. April 2. Puckered scar in beginning of duodenum. Mucous surface of ulcer not seen. Finney pyloroplasty.

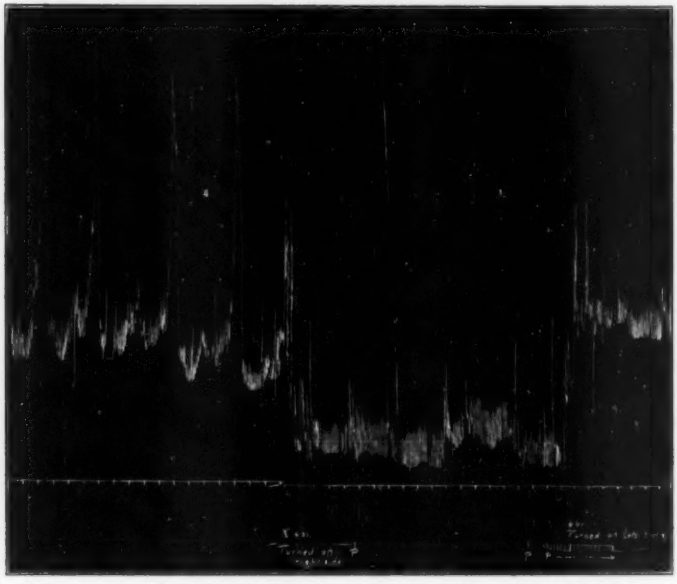

FIG. 4.—Case III. Duodenal ulcer. Fairly vigorous hunger contractions (empty stomach), which ceased on turning patient from left side to right. A moment of pain corresponded to low contraction on left of record. Pain indicated by signal on lower line (and by letter *P*). It became continuous nine minutes after turning upon the right side. Establishment of continuous pain noted by frequently depressing pain signal and then holding it down. Alterations in tension are due to changes in position. No contractions after pain began. Half-minute markings.

Motility Study II. April 22. Twenty days after operation. Twelve hours after eating. Two contraction periods seen. First period with the patient lying on his back. The second with the patient lying on his left side. This period ended soon after turning the patient upon the right side, possibly a coincidence, but interesting in connection with the preoperative study (Fig. 5). No sensations noted by the patient.

Summary of Case III. Chronic duodenal ulcer. Gastric contractions on fasting stomach without pain. Pain without gastric contractions. Apparent influence of position on pain and contractions.

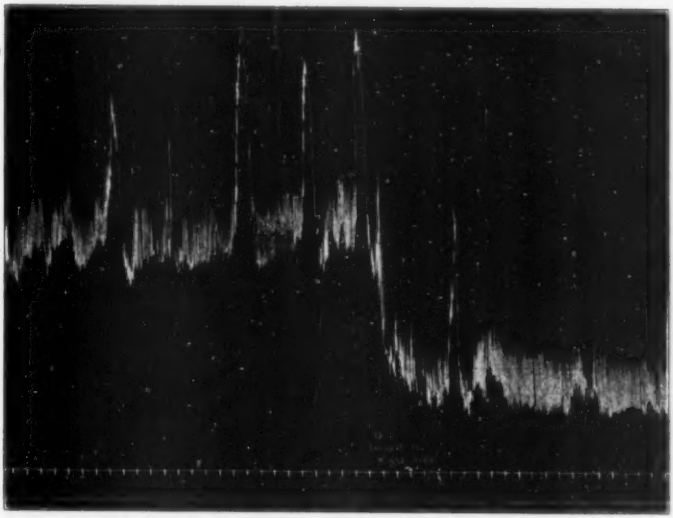

FIG. 5.—Case III. After operation. Short period of hunger contractions on rather high tonus. Cessation of period soon after turning to right side. No pain; clinically well. Compare with Fig. 4. Half-minute markings.

DISCUSSION. Taking up these cases separately, Case I falls into the class of those ulcers which give rise to pain of a continuous nature. Food relief was short and incomplete and was followed by an accession of pain which slowly died down to the previous, dull, continuous level. Such a condition has been classified by Friedman[4] as belonging to a group of cases characterized by adhesions, high acidity and prolonged pyloric spasm. According to Carlson it would again be placed as an instance of pyloric contraction in the presence of ulcer and high acidity. The absence of any recognizable contraction of the fundus would not then interfere with the interpretation of pain as due to excitation of oversensitive pain nerves tortured by active muscular contractions of the pyloric region (which are not recognized in the balloon method of study). One may therefore say there is no evidence in this case which supports the interpretation of pain as being due to muscular activity of the stomach, and, on the other hand, no evidence to oppose this

[4] Time Relations of Gastric Pains, with Special Reference to Gastric Adhesions, AM. JOUR. MED. SC, 1916, cli, 735.

hypothesis, since pyloric contraction may, in fact, have taken place, due to the acid reflex from the duodenum.

Case II, however, is difficult to explain under any hypothesis. The patient presented a typical gastric ulcer history, high continuous acidity, some "grinding" pain and on balloon study, typical powerful hunger contractions without a trace of pain. On a full stomach (the same day as that on which the hunger contractions were demonstrated) the pain came on some three hours after eating, waking the patient from a sleep, during which gastric digestion peristalsis had been quite active. As the pain appeared the gastric peristalsis ceased, the tonus was lowered and the effect was conveyed that the onset of pain had diminished gastric activity. The effect of the patient's position in bed (as in Case III) is noteworthy. The pain appeared while the patient lay on his left side, and soon disappeared, without other treatment, upon turning over upon the right side. As the pain disappeared, gastric peristalsis was resumed and tonus increased. Coincident with this relief the patient passed gas by the rectum. One might suppose, therefore, that the position of the abdominal contents, and possibly some drag on a sensitive mesenteric attachment, for which a cause might be found in the posterior penetration of the ulcer, were more concerned with the pain than the gastric activity itself. It is certainly true that intense hunger contractions caused no pain and that pain was coincident, with no demonstrable gastric contractions.

Case III was one of "copy-book" duodenal ulcer; typical pain, food relief and acidity. Again, the pain was absent during active hunger contractions and occurred with the cessation of these contractions. In this case, again, the position of the patient seemed to influence the pain. It began while the patient lay upon his right side (low gastric tonus, no contractions), ceased at once on turning upon the left side (hunger contractions began), and when the patient turned back to the right side the pain soon became continuous (low tonus, no contractions).

The relation of pain to motility of Cases II and III was strikingly alike, though the nature and situation of the pain was quite different, and one might have expected that the lesions would have had some points in common. However, one was a penetrating gastric ulcer adherent to the pancreas and the other was a duodenal ulcer, almost reactionless and unusually free from adhesion of any sort; in fact, the duodenum was so mobile that a Finney pyloroplasty was easily performed. It seemed in Case II (the gastric ulcer) that the obvious involvement of the base of the large intestine must have been concerned with the pain, especially since relief was coincident with the passage of flatus by the rectum. The same mechanism cannot be invoked in the duodenal ulcer.

Carlson suggests that when no gastric contraction is found to coincide with pain that the pain is likely to have originated in

pyloric spasm reflex upon the passage of acid gastric contents into the duodenum. There is nothing in these studies to confirm or disprove such an hypothesis. There is evidence, however, that, even in the presence of an active ulcer far removed from the pylorus, powerful contractions of the fundus may cause no pain, and pain may occur independently of any muscular activity of the fundus.

ANATOMIC POINTS DETERMINING THE DIRECTION OF THE NEEDLE AND THE PROPER ROUTE FOR LUMBAR PUNCTURE IN CHILDREN AND ADULTS.

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Upon consulting the voluminous literature on rachientesis, one is immediately impressed by a certain diversity of opinion as to many of the essential points of the technic. There appears to be in general a tendency to treat lightly the details of the procedure, despite the fact that it is these apparently minor points of technic that are so important in bringing about a successful result. This is more especially the case because lumbar puncture is a "blind" operation and is guided mostly by the sensation of touch, and success depends in no small measure on the correct site of introduction and direction of the needle.

During the 1916 epidemic of poliomyelitis, and subsequent to that time we were privileged to perform or supervise the operation in over 1000 lumbar punctures in all varieties of meningeal conditions, and for both diagnostic and therapeutic purposes. Clinically, we were impressed by certain points relative to the technic which seemed to facilitate the puncture and which rendered dry taps an unusual, indeed almost rare, complication. It is our present purpose to speak of two of these points, one relative to the route for puncture and the other concerning the direction of the needle.

The conclusions ultimately drawn were made first on the living subject and were later confirmed by studies in the dissecting room on the cadaver.

The Route for Puncture in Children. There exists some divergence of opinion among authors as to the route to be employed in young patients. Most authorities, however, seem to concede that the median route is most advantageous. Anyone who has performed a number of punctures, using the median route, must certainly be impressed by its simplicity in children.

There are several reasons for the superiority of this route over the lateral: The spinous process of the lumbar vertebræ in young

patients are more or less rudimentary. They are short, thick and horizontal, often tipped with cartilage, and they do not overlap (see Figs. 3, 4 and 5). Thus there exists between them an interval which is often quite wide and which permits the introduction of the needle without any liability of touching the spines. (The shape of these interspinous spaces, Quincke[1] appropriately designated as oval or rhombic.) Moreover, the interspinous ligaments at an early age are only slightly developed; in fact, when the needle has pierced the skin and outer layers of the supraspinous ligaments it quickly glides through the remaining tissues and is immediately felt to lie within the dural sac, the distance traversed being very small, as little as 13 mm. in a young infant.[1] By flexion of the spine, which is usually easily attained in young patients, the back is rounded out, the interval between the adjacent spinous processes is widened and the operation is further simplified. It must be remembered, too, that in young children the lumbar region of the back is covered by a very thin layer of subcutaneous and muscular tissue, beneath which the peritoneum is encountered. In lateral puncture it is evidently possible for the novice to miss his mark and penetrate deeply into the tissues of the opposite side of the back, even reaching and passing through the peritoneums and wounding some of the abdominal parieties, especially the kidneys. This is well-nigh impossible by the median route unless great force is used.

The only arguments which can be truthfully made against the median route in children is that in infants especially the room for approach is less than with the lateral route. Nevertheless, the space between the spines is amply wide to allow the passage of even a larger caliber needle without the slightest difficulty.

On several occasions during autopsies on young children and infants we have noticed the character of the vertebræ. At this age they are not distinct and separate bones connected merely by ligamentorous attachments as in adults, but, on the contrary they appear *en masse*, partly cartilaginous and united into one piece, from which the individual bones are separated only with the greatest difficulty, and even then incompletely. The spinous processes are very rudimentary straight and largely cartilaginous. The supraspinous ligaments are relatively strong and intimately blended with the cartilaginous spines. As a result of this construction, when a large caliber needle is introduced the elasticity of the entire spine is so great that it allows quite an anterior bending of the supraspinous ligament before the limit of elasticity is reached and the ligament is penetrated. Anyone who has performed many punctures in infants by the median route must have experienced at the initial introduction the same sense of resistance, especially if the needle is not sharp and is of large caliber, which latter requisite is, of course, only essential for serum treatment. This constitutes, of course, a slight disadvantage to median puncture. However, these few argu-

ments against it are greatly offset by its numerous advantages, which are explained later on under the route for puncture in adults. Suffice it to say here that its great simplicity, the certainty of the result, the easy facility with which a beginner acquires the method, the diminished liability of injuring nerve filaments or bloodvessels, the advantages for spinal anesthesia or serum injections are among the points strongly in its favor.

THE ROUTE FOR PUNCTURE IN ADULTS. In adults the majority of authors are strongly in favor of the lateral route. Quincke[1] originally recommended introducing the needle a few millimeters laterally because of the strong interspinous ligaments which are often encountered in the median line in robust individuals. Stewart,[2] Starr,[3] Foote,[4] Holmes,[5] Ruhräh and Mayer,[6] Porter,[7] De Ridder,[8] Heiman,[9] Wolf,[10] Holwell,[11] Donitz and Bier, Spear,[12] Duflos[13] and numerous other authorities advise the lateral route. Foote[4] contends that the needle should be started one-half inch to the right or left of the median line, thus avoiding the necessity of forcing it through one inch of supraspinous and interspinous ligaments. Duflos[13] introduced the needle 7 to 8 mm. from the median line and claims that the ligamentum subflava offers only slight resistance, but he admits that these ligaments may become ossified in older persons. De Ridder[8] advises that the needle be started at a point 1.5 cm. outside the midline. Ker[14] resorts to the lateral route only in adults with strong tough interspinous ligaments.

Lavalle,[15] Cabot,[16] Kaplan,[17] Lorenz,[18] Sophian,[19] Neal and Du Bois[20] and Barker[21] are among the very few writers who make use of the median route in adults. Kaplan[17] punctures in the sitting posture, introducing the needle in the median line and straight forward. Sophian,[19] while admitting some of the advantages of the lateral route, claims the median has the great advantage of simplicity and is easily performed even by the inexperienced. Lorenz[18] is strongly in favor of the median line, stating that he employed the lateral route in a large number of punctures in which dry taps frequently occurred, but since he has made use of the median failure to obtain fluid, occurs in less than 2 per cent. of his cases. Lavalle[15] is strongly convinced of the advantages of the median route and mentions Guinard's name as an advocate of the method. Neal and Du Bois,[20] whose experience in meningeal conditions has been unusually extensive, use the median line.

Most authors opposed to median puncture base their main objection on the thickness of the supra- and interspinous ligaments in the adult and on the resistance which they claim these ligaments offer to the passage of the needle. A few object because of the alleged danger of breaking the needle especially in a restless, violent or delirious patient by the sudden extension of the back.

In order to determine the foundation for the objections to the median route as based upon the thickness and resistance of the inter-

spinous ligaments, the author undertook a study of these ligaments postmortem in a small series of three adult cadavers, of thirty-five, forty and forty-eight years, respectively. The dissections were performed on spines which had been disarticulated from the rest of the cadaver, and freed from their neighboring muscular attachments leaving the spinal ligaments and vertebral column separate. The findings in these dissections may be summarized as follows:

The supraspinous ligaments are rather firm fibrous cord-like ligaments extending between the apices of the adjacent lumbar spines connecting them together. The ligament is not more than 2 mm. in thickness as a rule.

The interspinous ligaments are thick quadrilateral-shaped pearl colored, white membranes attached along the whole length of the inferior border of each spinous processes, from its root to its summit and extending downward to the same parts of the superior border of the spinous process below. The ligament is in reality composed of two folds or layers of fibers, one on either side, with a clearly defined line of separation between them, not noticeable, it is true, when they are covered posteriorly by the supraspinous ligament, but rendered very obvious if the latter are dissected away and a sharp object, as, for example, a needle, is introduced between. It is apparent that if the needle be kept to the median line the interspinous ligaments hold it tightly between their layers and tends in this way to guide it forward, usually without it piercing through either lateral fold. Guided thus it attains with ease and precision the interarcuol space.

As to the resistance of the ligaments it may be said that while the supraspinous ligaments offer some resistance at the start, it is trifling and is easily overcome, and also that the interspinous ligaments offer no obstruction to a good strong steel needle.

Therefore, we feel justified in concluding that instead of the interspinous ligaments being a contraindication to the use of the median route they are, in most cases, a great aid in holding the needle safely to the median plane and directing it thus to the interarcuol space, often, indeed, with unerring precision.

Therefore, it is evident that the objections to median puncture because of the ligaments which must be transversed are not corroborated by studies upon the cadaver in this small series of dissections. Likewise, in the living, we have only rarely encountered a patient in whom the operation by this route could not be successfully performed, despite the fact that many of our own cases were adults and were strong, muscular individuals. We do not doubt, however, that in some patients, especially the aged, these ligaments will be altered to such an extent that they will offer great resistance; but there is every reason to suppose that in such cases the ligamentum subflava will likewise be changed. In fact, it seems plausible to think that ossification of the yellow ligament would be more

apt to occur earlier in life than that of the interspinous ligament owing to the greater range of movability of the spinous processes as compared to the lamina.

The possibility of the needle being broken in the instance of a violently delirious patient is probably slightly greater with the median route than with the lateral, but on the other hand such patients should always be controlled by chloroform anesthesia. In the usual case on the contrary, the lateral route is more apt to be accompanied by this type of accident for the needle more commonly encounteres bony obstacles and repeated poorly directed thrusts with the instrument are very common, especially in the hands of an inexperienced operator.

Therefore, since the arguments against median puncture do not stand the test of proof, let us look into its advantages over the lateral route. The median is a clearly defined procedure; it is very simple and is quickly and easily learned by the novice. There can be no doubt that dry taps are encountered less frequently than with the lateral method. This is readily understood, because in lateral puncture the needle must be started at just a certain point and given a definite inclination inward and upward in order to penetrate the subarachnoid space in the median line. The chances of error in the direction given to the needle, either that it may be directed too much inward, causing it to pass entirely beyond the interarcuol space, or too much upward, causing it to impinge upon the vertebral arch above, resulting in both cases in a dry tap, are evidently great. The disadvantages of the lateral route are therefore evident for one who is not experienced in rachientesis.

The liability of injury to the nerve filaments of the cauda equina or to the spinal bloodvessels is less with the median route; in fact, Krönig goes so far as to state that it is only after lateral puncture that cases of nervous affliction due to injury of nerve fibers are observed. In spinal anesthesia it is essential that the dura be penetrated about in the midline so as to assure equable distribution of the anesthetic fluid injected. The same rule applies, also, to a less extent, to the injections of serums. In median puncture the dura is entered exactly in the median line, providing the needle has been directed straight forward, while in lateral puncture one has to calculate the proper direction to be imparted to the needle in order to strike the dura at the particular place desired. In the lateral route the instrument must traverse a deep layer of subcutaneous tissues and a thick mass of lumbosacral muscles, before reaching the ligamentum subflava and the dural membrane. The chances of the needle being plugged and the probability of encountering bloodvessels is greater. Moreover, one must remember that the yellow ligament is thicker and stronger in the lumbar region than elsewhere. Holwell, although an advocate of the lateral route, admits that the resistance which the ligamentum subflavum offers may be so great

that the operator may think he has encountered bone. Although some writers, especially Grey,[24] claim that pain from striking the periosteum of the spine is more intense and common in median puncture, we have never found this to be the case; on the contrary, everything points to the lateral route as being the most painful, since the needle more commonly strikes bone.

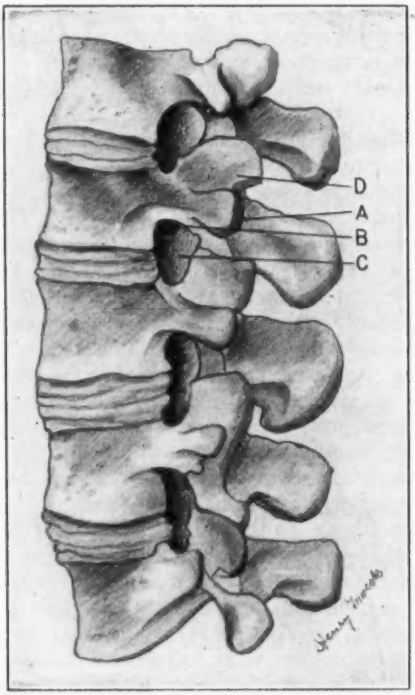

FIG. 1.—Drawn from a prepared specimen in the anatomical department of the Bellevue Medical College, to illustrate the appearance of the lumbar vertebræ of an adult in the normal upright position. The downward inclination of the spinous processes are very evident; this inclination being accentuated by the tubercles on the inferior border. The various processes are indicated diagrammatically by letters: *A* represents the transverse processes, *B* the laminæ, *C* the small interlamellar opening through which the needle must pass to reach the subarachnoid space in the lateral puncture, *D* the articulating processes.

A glance at Fig. 1, picturing the lumbar vertebræ in lateral view, will be enlightening in showing the difficulties which the lateral route presents. The inner angle of the narrow space between the laminæ represents well the interlamellar opening through which the needle must enter (Fig. 6). This opening is of a sufficient size, if one had some guide by which to reach it, to act, for example, like the inter-

spinous ligaments in median puncture; but there is no such anatomical help or path to be followed in lateral puncture; instead, the needle is plunged to a depth of 2 to $2\frac{3}{4}$ inches into a mass of subcutaneous and muscular tissues, hoping that chance and the estimated inward and upward direction of the needle will guide it to the interlamellar opening. It is evident that the probability of striking

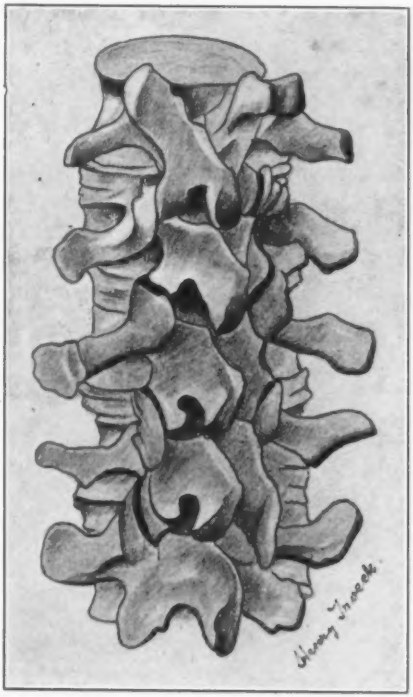

FIG. 2.—The same, posterior view. The inclination of the vertebral spines are very definite and also the sharp character of the superior border and the downward and outward direction of the external surface of the spinous process and laminæ. The entirely different structure of the inferior border of the spinous process will be noted, also its notched and rounded contour just where it opens into the vertebral canal.

bone is great and that repeated thrusts may be needed before the space is reached, thus often rendering uncontrollable a patient who at first was docile and quiet, further adding to the difficulty of the operation. The difference between the two routes may then be summarized by saying that in the lateral, chance plays a great part, while in the median the operator arrives usually with unerring precision at the interarcuol space.

THE DIRECTION OF THE INSERTION OF THE NEEDLE IN CHILDREN. Quincke,[1] in his original and classic description of the technic of lumbar punctures, describes the characteristic oval or rhombic shape of the interspinous spaces in children and the horizontal direction of the spinous processes, as noted in a series of studies on the skeletons of twelve children. Upon this anatomical basis Quincke claims that

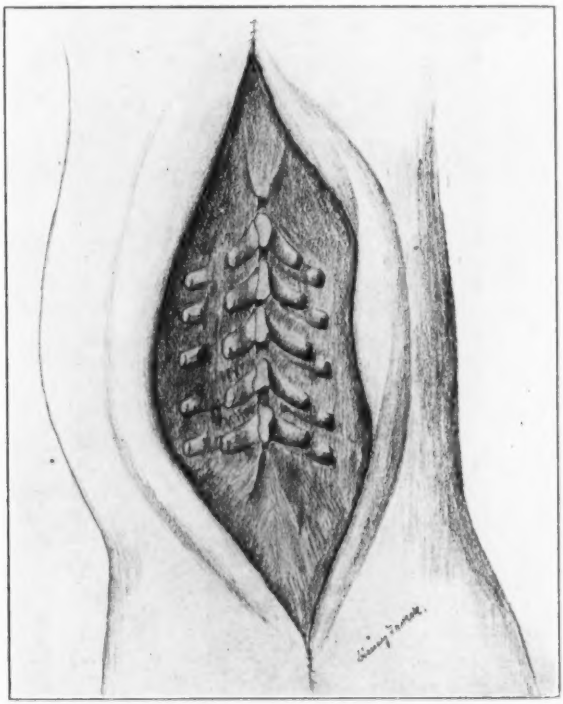

FIG. 3.—Gives an idea of the appearance of the lumbar region of the spine in an infant, aged four months. The body has been placed downward and with a slight support under the abdomen to bring out the structure of the spine more clearly by causing a certain amount of spinal flexion. The lumbosacral muscles have been removed partially so as to expose the various spinous processes and ligaments. Among the points to be noted are the rudimentary character of all the processes, their semi-cartilaginous structure, the amply wide interspinous intervals and the width of the laminæ and narrow interlamellar space.

in lumbar puncture by the median route on young patients the needle should be introduced directly forward perpendicular to the spines. Among the very few authors who follow closely the precepts of the master upon this point are Delmas[22] and Sophian. Most authorities, however, advocate that a slight upward inclination be given to the needle. Thus Gray,[24] Fisher,[25] Spear,[12] Ruhräh and Mayer,[6] Kap-

lan,[17] Testos[26] and Devraigne[27] are all of this frame of mind, the latter author basing his opinion upon experimental work on infant cadavers.

Clinically, we have been impressed by the simplicity of the median route when the needle is introduced in a direction absolutely perpendicular to the spine and with back well arched, so as to increase

FIG. 4.—Illustrating the character of the lumbar vertebræ in a child, aged six years; posterior view. The spinous processes, the laminæ and transverse processes are more developed and the process of ossification is more advanced than in Fig. 3. The degree of flexion of the back is very slight and for this reason the separation between the adjacent spinous processes is not nearly so much as that attained in the living subject when the back is well arched in preparation for rachientesis. Yet even here the interspinous interval is definite and free from any bony obstruction.

the width of the interspinous spaces. The needle then encounters no bony obstruction and is passed into the subarachnoid space without difficulty. At the postmortem table we have been able to examine the structure of the lumbar region of the spine in a number of children. The spinous processes are broad, quadrilateral-shaped projections, running in a perpendicular direction to the body of the vertebræ, with a straight even superior and inferior border having

practically no inclination upward and without any downward projecting tubercles upon their summit. The typical appearance is

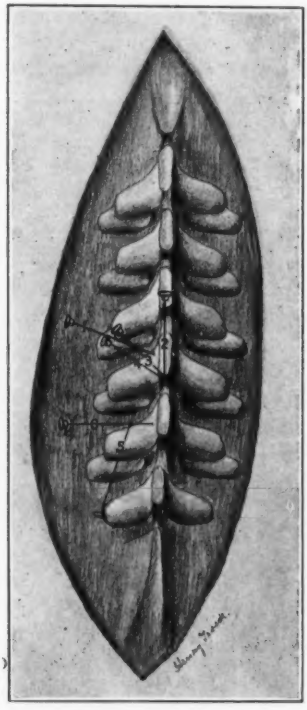

FIG. 5.—Illustrating the appearance of the five lumbar and first sacral vertebræ in a child, aged eight years; posterior view. The development of the various processes is more advanced than in Fig. 4. To show the simplicity of the median and the difficulties of the lateral route, owing to the diverse directions the needle may take, a number of needles have been introduced into the spine in various positions. All have been introduced as in left lateral puncture except No. 2. In *1* the needle introduced at an improper level has impinged upon the spine of the fourth lumbar vertebræ of the same side. In *2* the proper method of introducing the needle by the median route in the fourth lumbar interspinous space is shown. In *3* the instrument has been inclined too much inward and not sufficiently forward, and as a result it has passed through the interspinous ligament and is buried in the soft parts of the opposite side. In *4* it has pursued a similar course but encountered the transverse process of the opposite side. In *5* it has been directed too much upward and not enough toward the midline, causing it to strike the transverse process of the same side. In *6* the needle introduced at an incorrect level has impinged on the spine of the fifth lumbar vertebræ. The chances of error in lateral puncture are therefore obvious. In a very similar manner, but much more easily, owing to the distance to be traversed, the needle may go astray in the case of an adult spine.

shown in Figs. 3, 4, 5 and 6. When the back is flexed practically no alteration is produced in the direction of the lumbar spines but the height and depth of the interspinous spaces is increased considerably,

the processes becoming widely separated. This separation is made possible by reason of the thickness of the intervertebral fibrocartilagenous disks in the lumbar region, permitting a close approximation of the anterior portions of the vertebral bodies.

By reason of the structure of the lumbar spines in childhood it is evident that the only proper method of introducing the needle is in

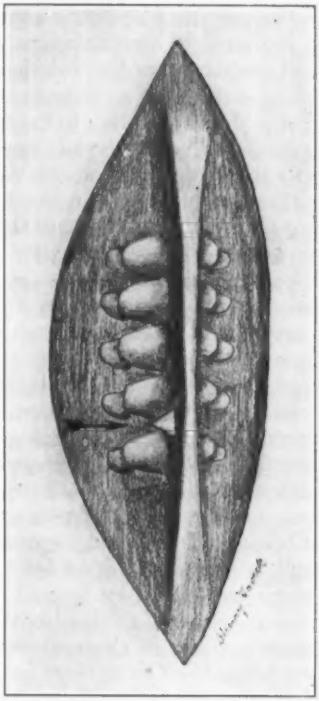

FIG. 6.—Illustrates the appearance of the lumbar region of the spine in a young child, the spinal ligaments remaining intact. The arrow indicates the small triangular area in the interspinous ligament and the ligamentum subflava through which the needle must pass in lateral puncture in order to reach the interarcuol space. The area is proportionately smaller in an adult, and the depth to which the needle must be introduced is of course much greater (6 to 9 cm.) further adding to the difficulties of reaching the desired point, the more so as there is no definite guide to follow.

an exactly perpendicular direction, following in this way the direction of the spinous processes themselves. Any upward inclination imparted is unnecessary and increases proportionately the dangers of a "dry tap."

This method of inserting the needle is applicable to children below the age of puberty. It is about this time that the character of the lumbar spines begin to change, assuming more of the adult type,

necessitating, often, certain modifications in the technic which will be explained below.

THE DIRECTION OF THE INSERTION OF THE NEEDLE IN ADULTS. The consensus of opinion among authors using the lateral route in adults is that the needle should be introduced inward and slightly upward. The degree of this angular inclination, however, is not specified. Thus, Holwell,[11] Foote,[4] Ruhräh and Mayer,[6] De Ridder,[8] Ker,[14] Kaplan[17] and Holmes[5] consider that an upward and inward direction should be imparted to the instrument. Musser[28] alone mentions the angle of inclination to be used; he believes that the needle should be held at an angle of 45 degrees with the surface of the body. Elsberg[29] also draws attention to the fact that occasionally the needle must be introduced obliquely upward to avoid the bone. In punctures by the median route, Ker[14] states that the needle should be inserted either absolutely straight or with a slight upward slant. Barker,[21] using the same route, contends that a slight upward inclination be given. Quincke[1] in his classic article upon the subject advocated in lateral puncture that the needle should be held rather upward than otherwise, at the same time drawing attention to the character of the intervertebral spaces in the adult. They are not oval or rhombic-shaped openings, as in the child, but, on the contrary, are covered more or less by the inclination downward of the vertebral spines. In a later presentation[30] he remarks that "the spinous processes run generally horizontal, still sometimes are inclined downward or possess on their points hook formed downward bended extensions."

In Gray's text-book on *Descriptive Anatomy* the lumbar spinous processes are described as thick, broad, somewhat quadrilateral projections, horizontal in direction, thicker below than above and termination by a rough uneven border.

We have studied the character of the lumbar vertebræ in a small number of adult skeletons, and in three dissections upon adult cadavers previously referred to. Our findings have been somewhat similar to those of Quincke, and may be summarized as follows:

The lumbar spines are not always as horizontal and straight as one is apt to believe for text-book descriptions. In a high proportion of cases in the normal upright position the lumbar spinous processes have a distinct downward inclination which is considerably increased by a projection of the tubercles on the inferior border. This is evident from Fig. 1, showing the lumbar vertebræ from behind and from lateral view. When the spine is well flexed the interspinous intervals are widened, but the direction of the vertebral spines are only slightly altered. They become less overlapping, however, and this renders possible the introduction of a needle between in a perpendicular direction at an angle of 90 degrees, which in the normal position of the spine would have been impossible, owing to the fact that it would have been impinged upon the

superior border of the spinous process of the vertebræ below. In some instances, however, even with the back well arched, it is impossible to introduce the needle in a straight perpendicular direction, without striking the superior border of the spinous process below. Under such conditions the operator, thinking that he is unable to enter by the median line, usually directs his needle more laterally, and as a result it impinges upon the outer surface of the lamina. A mistake in direction has then been made which can only be rectified by the complete withdrawal of the needle and its reinsertion. When a bony obstacle of this character (superior border of the spinous process below) is met the operator should withdraw the needle just sufficiently to allow its being directed upward at an angle of 60 to 45 degrees.

Just in what proportion of adults it is necessary to introduce the instrument at an angle of 60 to 45 degrees, by virtue of the construction of the lumbar spines, is difficult to state; it is certainly in the minority the number could be approximated 10 to 15 per cent. As a general rule it may be said then that if the back can be well flexed the needle should always be introduced directly perpendicular to the spine at an angle of 90 degrees. This direction will succeed except in a minor percentage of cases. If bone is encountered the instrument is then directed obliquely upward at an angle of 60 to 45 degrees, and this will always be followed by the disappearance of the bony obstruction and the entrance of the needle into the subarachnoid space except in rare instances.

When there is slight opisthotonus and the back cannot be well flexed or the lower limbs well drawn up, owing to rigidity, the spinous processes cannot be separated, and a perpendicular puncture at an angle of 90 degrees is commonly unsuccessful. Under such circumstances it is advisable to insert the needle in an upward direction, usually at an angle of 60 to 45 degrees. In a position of marked opisthotous many operators consider puncture is impossible without an anesthetic. Our experience does not confirm this viewpoint, and it seems to us that by the median route, with a sufficient inclination of the needle upward (45 degrees or less), the interarcuol space can be attained.

In the aged especially the spinal ligaments are not so pliable and the intervertebral disks are less compressible; hence, spinal flexion is more difficult to obtain, and for this reason it is usually advisable in such patients to give the instrument a decided direction upward.

There is an anatomical arrangement which we have encountered in our dissections and which no doubt also helps to explain some of the cases in which no fluid is obtained by a perpendicular introduction of the needle, but which yields fluid if the needle is directed upward. The superior borders of the lamina are rather sharp with their prominent external surface slanting and inclined downward and outward. The inferior borders, on the contrary, are notched

and rounded, presenting the opening of the vertebral canal. Naturally a needle directed at an angle of 90 degrees and in the median line, and deviating slightly from its course, may easily impinge upon the superior border of the lamina, and will then be directed outward away from the vertebral canal. On the contrary a needle directed upward at an angle of 60 to 45 degrees and veering from its median course would either pass immediately into the vertebral canal or else, impinging on the rounded inferior border, would thereby be directed inward, reaching the desired point.

RESUMÉ. There is considerable confliction of opinion among authors upon many of the details of the operation of rachientesis. The route for puncture and the direction of the needle are among the points over which there is much controversy. Yet it is unquestionable that these two parts of the operation must be properly carried out in order to bring it to a successful termination. From clinical experience, which was later confirmed by experimental work upon the cadavers of adults and children, both in the dissecting room and at the autopsy table, we believe the following conclusions upon these points are warranted:

1. The median route is greatly superior to the lateral route for the puncture of children by reason of its simplicity. The lumbar spinous processes of children are rudimentary, rather short, horizontally directed and partly cartilaginous processes, which have a fairly even superior and inferior border, somewhat rounded at the summit of the process but without any tendency to overlap. When the spine is well flexed there exists between them an interval (the interspinous space) which is usually quite wide and which permits the introduction of the needle in the median line without any liability of touching the spines. The distance to be traversed is very small, especially in young children; in fact, after the needle has pierced the skin and the supraspinous ligaments it quickly glides through the interspinous ligaments and is immediately felt to penetrate the dural sac. In the case of young children and infants a slight resistance is offered by the rather tough supraspinous ligaments, but this is easily overcome and is the only difficulty encountered in the median line. The quickness, simplicity and certainty of the result and the easy facility with which a beginner acquires the method are among the many points in favor of the median route for young patients.

2. The construction of a child's spine differs from that of an adult's. At an early age the vertebræ are not distinct and separate bones connected by ligamentous attachments as they are later in life; but, on the contrary, they appear *en masse*, partly cartilaginous and united into one piece, from which the individual bones are separated only with difficulty. The line of cleavage and the degree of movability is more definite between the spinous processes than elsewhere. The laminæ are rather short, wide, and the interlamellar

spaces are directed rather obliquely downward and are quite narrow, further adding to the difficulty of the lateral route.

3. Many authors base their objection to median puncture in the adult on the thickness and resistance which they claim the interspinous ligaments offer, especially in muscular individuals. To determine the basis for this argument the author studied these ligaments on several adult cadavers. This study gave the following findings: The supraspinous ligaments are rather tough, fibrous, cord-like ligaments extending between the summits of the adjacent spinous processes. The interspinous ligaments are rather thick, quadrilateral-shaped, pearl-colored ligaments attached along the whole length of the inferior border of each spinous process from its root to its summit and extending downward to the same parts of the superior border of the spinous process below. The ligament is in reality composed of two folds and layers of lateral fibers, with a clearly defined line of cleavage between. For this reason when a needle is introduded in the median line after penetrating the supraspinous ligament it enters the interspinous ligament and passes along between its two layers, and is thus guided forward with precision to the interarcuol space. Marked resistance is not encountered even in muscular individuals except in rare instances. Therefore, instead of the interspinous ligament being a contraindication to the use of the median route they are in most cases a great aid in holding the needle safely to the median line and directing it thus to the interarcual space, often, indeed, with unerring precision.

4. Among the advantages of the median line for puncture of adults are the following: It is a clearly defined procedure and is quickly and easily learned by the inexperienced; no calculation is necessary as to the direction inward and upward to be imparted to the needle in order to reach the interarcual space as in lateral puncture. The liability of striking bone and bending or breaking the needle or wounding the periosteum is less. The possibility of passing beyond the limits of the interarcual space is reduced to minimum while it is ever present with the lateral route. The injury of nerve filaments or spinal bloodvessels is less likely to occur. No difficulty is experienced in penetrating the dural sac exactly in the median line, as in the lateral route, which point is important for spinal anesthesia and serum injection. The chances of the needle being plugged by the tissues traversed and of bloodvessels being encountered is less with the median than with the lateral route. Dry taps are less common in median puncture. In other words, chance plays a great part in lateral puncture, while in median the operator arrives usually with unerring precision at the interarcual space.

5. In the case of children the needle should be introduced directly perpendicular to the spine (at an angle of 90 degrees) and in the median line. This method is obviously the rational one to employ, as a study of the characteristics of the lumbar spinous processes

and the shape of the interspinous spaces shows. The needle then encounters no bony obstruction and is passed into the subarachnoid space without difficulty. Any upward inclination increases proportionately the danger of a dry tap.

6. In adults the anatomical structure of the spine differs from that of a child, and this fact influences markedly the manner of insertion of the needle. The lumbar spinous processes are not as horizontal as at an early age, but have a distinct downward inclination, which is considerably increased by a projection of the tubercles on the inferior border. Flexion of the spine widens the interspinous intervals but does not appreciably alter the direction of the spines themselves. With the spines well flexed, however, the interval between the adjacent processes is widened sufficiently to allow the introduction of a needle in the majority of instances in a perpendicular direction (90 degrees) to reach the subarachnoid space without encountering bone. In some cases (a decidedly minor percentage) it is impossible to introduce the needle in a perpendicular direction without having it impinge on the bony obstruction of the superior border of the spinous processes of the vertebræ below. In such instances the needle's course should then be changed by withdrawing it slightly and directing it obliquely upward at an angle of 60 to 45 degrees, and this will always, except in rare cases, be followed by the disappearance of the bony obstruction and the entrance of the needle into the subarachnoid space.

7. It is possible to obtain fluid by the median route in adults even in cases of marked opisthotonos if a sufficiently marked inclination upward is given to the needle.

8. Flexion of the spine is attained only with difficulty in elderly individuals, hence the needle should be introduced slightly upward from 70 to 45 degrees.

9. Certain anatomical configuration of the spine helps to explain why some cases of failure to obtain fluid by the median route, with a perpendicular insertion (90 degrees), may be due to a deviation of the instrument from the median line and its impinging on the superior border of the lamina, while a more upward inclination would have been entirely successful even though a similar deviation of the needle occurred.

The writer wishes to take this opportunity to thank Dr. Abraham Sophian for first demonstrating to him the simplicity of rachientesis by the median route, thus affording the incentive to the present study.

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PHYSIOLOGICAL CONSIDERATIONS IN THE IMMEDIATE TREATMENT OF DANGEROUS HEMATEMESIS.*

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I. The Condition of the Circulation. In hemorrhage the fall in arterial pressure from great loss of blood volume is counteracted, as far as possible, by certain reactions in the body, the chief of which is the contraction of the peripheral arterioles, the result of stimulation of the vasoconstrictor center. This contraction is a gradually increasing one as the hemorrhage progresses (Wiggers), except that at a late stage there is paralysis of the vasoconstrictor center with general vasodilation (Pilcher and Sollmann). As the cerebral and the cardiac coronary arteries are not under the control of the vasoconstrictor center the general peripheral constriction does not include them, and consequently there is a greater flow of blood

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through these unconstricted arteries, a provision in nature to maintain the efficiency of the vital organs, the brain and the heart. Indeed, the coronaries at least not only do not contract but may even dilate, for it has been shown by Wiggers that after hemorrhage the coronary flow equals or exceeds the normal flow even though the systemic arterial pressure is below normal.

The heart therefore does not suffer so much as other organs, and as shown by cardiographic tracings, maintains its normal contractile power even after considerable loss of blood. (Wiggers.) There is therefore ordinarily no reason for giving strophanthin or digitalis or any other drug to maintain the heart, and there is contraindication to any drug, such as nitroglycerin, to overcome the general peripheral constriction, which is not only a necessity for the maintenance of the blood supply to the heart and the vital centers of the brain, but may be, in addition, the means of shutting off the bleeding vessel itself.

II. The Limit to Hemorrhage. Of much greater importance than the total amount of blood lost is the rate of loss, a sudden loss being a more serious matter than a gradual depletion to the same degree. But even with rapidity much blood must flow before the patient is in real danger. Experimental work indicates that it requires a rapid loss of from 4.5 to 5.5 per cent. of the body weight of a normal dog to cause death (Levin), and if we apply the minimum of these figures to man it would mean that the fatal point is not reached in a man of 150 pounds until he has rapidly lost $6\frac{3}{4}$ pounds of blood or about $6\frac{1}{3}$ pints. That this is correct for the human being has been shown by Gjestland, for in statistics bearing on the power of the human to lose blood and yet recover, he reports the cases of two women with postpartum hemorrhage who each lost about 3000 grams ($6\frac{2}{3}$ pounds) of blood and recovered, one woman being discharged from the hospital on the fifteenth day and the other on the twenty-seventh. If an illness antedates the hemorrhage, as in the case of cancer, chronic ulcer or cirrhosis of the liver, the fatal amount will, of course, be less, according to the extent and character of such preceding illness. But if the hemorrhage recur at several hours' interval the total fatal amount will be more, for the blood volume tends to be restored by absorption of tissue fluid, and the blood-making organs rapidly furnish a supply of blood cells.

III. The Cessation of Bleeding. The natural process by which hemorrhage is checked is the obliteration of the opening in the bleeding vessel. In some cases this is favored by the retraction of the vessel, but in all cases it requires the formation and retention of a clot at the opening. The clot, however, because of the force of the blood flow, does not form at once at the opening in the vessel, but beginning at some distance away reaches back by accretion until it covers the opening; then it stops the bleeding. The distance at which the clot thus begins to form is determined by the force of the blood ejection and the degree to which the blood is held in contact

with the injured tissues; therefore as the stomach is a hollow viscus it may permit a great deal of blood to spurt out into its lumen before any of the blood succeeds in clotting and clinging to the tissues in the immediate neighborhood of the lesion. This is one reason for the frequency of large hemorrhages from the stomach. Hence, in the treatment it is desirable to ensure *contraction of the stomach*, a state which not only tends to permit the bleeding vessel to retract instead of remaining on the stretch, as in a distended organ, but also, because of the larger and more closely packed folds of mucous membrane, may result in a retarded flow of blood.

In these cases of bleeding there is, as a rule, no thrombosis in the lumen of the vessel until some time after the opening of the vessel has been sealed. Hence the surface clot may at first be easily loosened, and if loosened permits resumption of the bleeding. Other factors which may interfere with the formation of the clot or may cause a clot to break loose are:

1. Active peristalsis.
2. Undue temporary increase of blood-pressure, such as may result from the accelerated respiration and increased heart-rate.
3. Sudden accesses of blood-pressure, such as may be brought about by vomiting and by large and rapid intravenous administrations of fluid.
4. Mechanical interference, as by injudicious lavage.

To favor and maintain effective clot formation we need therefore *a quiet contracted stomach, quiet heart and quiet respiration, avoidance of vomiting, and careful watching during the introduction of fluids to restore the blood volume.* The acceleration of the heart and respiration are due not only to direct depression of the vagus center and direct stimulation of the respiratory center, but also to the reflex effects of general nervousness and anxiety. The best remedy for these is a hypodermic of *morphin* which through its effects upon the respiratory and vagus centers slows the respiration and the heart, and by its action on the cerebrum lessens anxiety and nervousness. It also depresses or abolishes peristalsis, and by central action lessens the tendency to vomiting. These are very great advantages. But morphin has the striking disadvantage that while it abolishes peristalsis it also abolishes tone in the stomach wall, so that in large doses it produces an atonic dilatation, a state just the opposite of that desired. To counteract this I would accompany the morphin with a maximum dose of *strychnin*, for strychnin acts to promote tone in the stomach muscles and thus opposes the morphin disadvantage without appreciably counteracting the desired effects of morphin on the respiratory center, the vagus and the cerebrum. Contrary to a prevalent belief strychnin does not activate the circulation. *Atropin* has been employed to counteract the effects of morphin on the stomach, and it does this to some degree; but in the large doses necessary it also annuls the desirable control of the vagus over the heart.

Lavage. If the stomach remains distended and if there is evidence that the bleeding still continues, *i. e.*, that an efficient clot has not formed, lavage, in my opinion, may properly be employed. If the bleeding seems to have stopped or if the patient gags severely on the introduction of the tube, lavage should not be employed. Lavage should, of course, be carefully done, the amount of added fluid being rather small. That there is an advantage in the use of excessively hot or excessively cold water is rather doubtful, for such liquids are prone to set up peristalsis. The use of the tube has an added advantage in that it permits the introduction of a coagulant after the stomach is washed out, an ideal time for it to come in contact with the bleeding tissues.

Emetin has been employed to stop the hemorrhage, but its pharmacological action shows that there is no justification for its use for such a purpose. It is a depressant of the vasoconstrictor center (Sollmann), and at once or following a transient vasoconstriction it produces definite vasodilatation (Pellini and Wallace). Furthermore, Howell states that it retards clotting by causing a deficiency in the fibrinogen of the blood.

IV. Venous Hemorrhage. As the venous system of the stomach empties normally into the portal vein, and the average mean portal blood-pressure is only 10 mm. of mercury (Starling), a venous hemorrhage from erosion due to a stomach lesion is without great force and usually quickly ceases. Therefore, except in the rare cases of perforation of a very large vein, such as the portal, splenic or superior mesenteric, venous hemorrhage from an ulcer or cancer is probably never great. However, in the cases with portal congestion, as in portal thrombosis or cirrhosis of the liver, the portal venous pressure is much higher than this, and consequently venous bleeding is more vigorous and more prolonged. But even then the bleeding ceases as soon as the portal congestion disappears, and in all but exceptional cases is prone to be beneficial to the patient rather than harmful.

But in just these cases of portal congestion a serious venous hemorrhage with which we may have to deal is that from the submucous veins of the lower third of the esophagus. At one end these connect with the coronary veins of the stomach and at the other end with the systemic venous system, so that they form a free communication between the portal and systemic veins. In portal obstruction they undergo a compensatory dilatation (Quain), with a marked tendency to become prominent in the esophageal wall and to form varices. (See Figure.) Thus they are subject to traumatism or to spontaneous rupture, and when ruptured are a source of hemorrhage from both the portal and the systemic venous systems. Furthermore, owing to the comparative smoothness of the esophageal mucous membrane, the blood finds no hindrance to its flow and little tissue to clot upon and cling to. Moreover, as shown by Whipple and Hurwitz, in cases of hepatic cirrhosis there is a marked diminution in the fibrinogen content of the blood and consequent

retardation and imperfection in the clotting; or, as stated by Clowes and Busch "even in the presence of an adequate proportion of thrombin, the clot formed is not sufficiently tough to effect the desired result." Hence these hemorrhages, though venous, may be large and are occasionally fatal. As the blood is brought up by vomiting they are not usually distinguished with certainty from gastric hemorrhages; and as the passage of a stomach tube would be dangerous it should be the rule that *in hematemesis if there is evidence of portal congestion, lavage is absolutely contra-indicated.*

Roentgen-ray picture of the esophagus in a case of portal thrombosis, death being due to hematemesis. Autopsy by Dr. John H. Larkin at the City Hospital, New York. The veins were injected with a red-lead mixture.

V. Measures to Retard the Ejection of the Blood. For this purpose the substances in use are the local vasoconstrictors, such as epinephrin, and materials of colloid nature to increase viscosity.

Epinephrin (adrenalin) acts locally to constrict the bleeding vessel and so to retard the flow of blood and permit clotting. It is administered by mouth in amounts of 4 to 15 c.c. (1 dram to 1 ounce) of the 1 in 1000 solution of the hydrochloride, diluted with about 2 to

5 times as much water to make bulk enough to coat the stomach. It has the disadvantage that it tends to induce strong peristalsis. The same may be said of pituitary. Though when administered intravenously epinephrin distinctly increases the coagulability of the blood (Cannon and Gray) by increasing the prothrombin (Grabfield), and may constrict the bleeding vessel itself, it cannot safely be used intravenously because of its marked effect in heightening the systemic blood-pressure

The colloid materials in use are gelatin and acacia, which on injection intravenously or perhaps subcutaneously tend to increase the blood's viscosity and so to act mechanically to retard the escaping blood. We shall speak of these later.

VI. Measures to Increase the Blood Coagulability. Besides the actions spoken of above there is a natural progressive increase of the blood's coagulability as hemorrhage continues (Drinker and Drinker, Gray and Lunt). Indeed, so strikingly does hemorrhage tend to cease at the point of syncope that Crile has advised a return to the method of the older physicians who would sit the patient up and perform venesection to hasten the onset of syncope. J. Kaufmann reports seeing Kussmaul successfully carry out this principle in a case of extreme hemoptysis.

If by the natural processes adequate clotting fails to occur we may attempt to supply an agent that will hasten the formation of the clot. Accepting Howell's terminology for the sake of uniformity the clotting elements in the plasma of the circulating blood are: prothrombin, calcium and fibrinogen and in addition some thrombin; the anticlotting elements are antiprothrombin and antithrombin. In clotting the prothrombin is liberated, and, taking up calcium, changes to thrombin; and this free thrombin quickly precipitates the fibrinogen in the form of fibrin, *i. e.*, it produces clotting. In the intact vessels clotting is prevented by the anticlotting elements, which hold the prothrombin and thrombin in neutral combination. Normally there is a great excess of anticoagulants in the blood, so that much prothrombin and even thrombin may be added to the circulating blood without thrombosis resulting. (Davis.) In hemorrhage the disintegrating blood platelets and leukocytes and the tissue juices of the injured tissues supply the lipoid thromboplastin (cephalin, cytozyme, thrombokinase); and this has such an affinity for the anticoagulants that it breaks up the prothrombin combination and sets free the prothrombin to take up the calcium and coagulate the fibrinogen and so form the clot.

In profuse hematemesis there is no reason to suspect a deficiency in any of the coagulation elements of the blood, but owing to the rapid passage of the blood beyond the injured tissues, as in a hollow viscus like the stomach or esophagus, there are cases in which the prothrombin is not liberated quickly enough to form a clot at a point sufficiently close to the bleeding vessel to bring about cessation of the bleeding. The clotting takes place at the normal rate,

yet not quickly enough to be of use where it is wanted. Therefore, we think of the possibility of employing agents to favor clotting, even though, on testing, the coagulation time of the blood proves to be normal. For this purpose there are several substances for use both locally and systematically. They may be called *coagulants*, and the principal ones in use are:

1. Cephalin or thromboplastin.
2. Extracts of the blood-platelets.
3. Blood serum, the serum derivatives euglobulin and coagulose and defibrinated blood.
4. Whole blood.

The increase of coagulability through the local application of one of these coagulants can readily be comprehended, though it requires that the remedy be kept in contact with the bleeding tissue for several minutes. But the cessation of bleeding after the intravenous or even subcutaneous injection of a small amount of a coagulant is less well understood. Doubtless the administered element, if it acts at all, does so by changing the relations between the clotting and anticlotting elements present in the blood, and it may do this either by supplying a coagulative element, such as prothrombin, by supplying substances to neutralize the anticoagulant elements or by exerting some activating effect upon the blood-forming tissues. The coagulants can hardly be of use to check an immediate profuse hemorrhage, but they may be of value in a continuous small hemorrhage or in preventing a recurrence of profuse hemorrhage. The dose of any coagulant needs to be repeated frequently, as its action is short-lived.

Cephalin, or *thromboplastin*, acts by taking up the antiprothrombin and antithrombin and setting free the needed prothrombin and thrombin. It is marketed under the titles Thromboplastin-Hess and Kephalin. They both contain the physiological lipoid cephalin or thromboplastin, and both are prepared from brain tissue, though by different processes. *Thromboplastin-Hess* is a solution in Ringer's solution of tissue juice from the brain with a fine suspension of brain tissue. It is preserved by 0.3 per cent. of trikresol and may be sterilized by boiling. Hess verbally recommended to me a dose by mouth of 4 c.c. (℥j) in 15 c.c. (℥ss) of water every half-hour for three or four doses, but the manufacturers recommend 20 c.c. (℥v) diluted twelve to fifteen times with water. Dilution does not affect its coagulating power. It has been given in amounts up to 60 c.c. (℥ij) in a day without any toxic effects. It is also used subcutaneously or intramuscularly in amounts of 10 c.c. (℥iiss) at a time. The subcutaneous dose is painful. *Kephalin* is an ether-acetone-alcohol extract of brain evaporated until the yellow fatty or lipoid residue remains. It is not destroyed by boiling. For use by mouth or intramuscular injection its dose is 10 to 30 drops in physiological saline repeated every six or twelve hours. It corresponds in action with thromboplastin-Hess. It seems to be rapidly absorbed from

the alimentary tract, for Howell found that a solution given by mouth showed a lessening of the coagulation time in as short a period as forty minutes.

Kephalin and thromboplastin have also been introduced intravenously, but as they supply the material to produce coagulation of the blood, and so have a tendency to bring about thrombosis in the vessels, the procedure is a dangerous one. In 1 per cent. solution Mannheimer and Wang employed thromboplastin-Hess intravenously in tuberculous hemoptysis in twenty-two instances and noted no apparent benefit from any dose. In its undiluted form Wang injected 5 c.c. into the ear vein of a rabbit, and the animal died almost immediately, with a firm clot in the veins of the neck and in the right auricle, extending to the ventricle. Hess gave intravenously 2 c.c. (℥ss) of a 10 per cent. solution to a rabbit and shortened the coagulation time by one-half, though there was no clotting in the body. In dogs Howell found that an intravascular injection of kephalin, 0.1 gram per kilo, shortened the coagulation time from one-third to one-half without any intravascular clotting, the effect lasting for at least one or two hours. Apparently, therefore, a weak solution intravenously is of no use and a strong solution is not without danger, at least for any but hemophiliacs, who have an excess of anticoagulants in the blood. It is a question then whether any amount that would be effective could be used without danger. I have the word of Dr. Hess that the substance should never be used intravenously.

Coagulen is a powder prepared from blood-platelets by fractioned centrifuging, followed by desiccation and dilution with lactose. It is claimed that it is a preparation of lipoid material and that 1 gram (gr. xv) of the powder represents 20 grams (℥v) of dried blood. It is readily soluble in water and may be sterilized by boiling. According to Howell the platelets of blood yield both prothrombin and thromboplastin and the action of coagulen is that of thromboplastin. In gastric hemorrhage the local action may be obtained by the administration of 20 to 60 c.c. (℥v to xv) of a 10 per cent. solution by mouth. Fonio, its introducer, recommends 50 to 75 c.c. ($1\frac{2}{3}$ to $2\frac{1}{2}$ oz.) of a 3.5 per cent. solution intravenously and a similar amount subcutaneously, stating that the subcutaneous injection of a stronger solution is painful. From the intravenous use there is the same danger as in the case of thromboplastin.

Blood Serum. This is a plasma from which have been removed not only the blood cells but also the coagulative elements of the clot. It has therefore lost part of its power to induce clotting. It contains prothrombin and thrombin in combination with antithrombin, but it lacks fibrinogen. The prothrombin is intimately associated with its euglobulin fraction. Serum is not a powerful coagulant and does not cause intravascular clotting even when amounts of 200 c.c. or more are introduced intravenously. Yet in some cases it seems to have a value out of proportion to its coagulative power even when

employed subcutaneously, so that it has been considered by some an activating agent, stimulating the production of clot-forming elements. It has the great disadvantage that it contains 6 to 7 per cent. of proteins, and thus unless of human origin exposes the patient to anaphylaxis. It also rapidly deteriorates so that after fifteen days it has lost seriously in potency; therefore fresh serums, as from the human being, rabbit, sheep and horse, are preferable to stock serums. Ox and dog serums are too toxic to human beings to admit of their employment. According to Clowes and Busch human serum is in nowise superior in clotting power to that of the animals mentioned, yet it is preferred because, being homologous, it may be used in much larger quantities with safety. Lee and Vincent state that rabbits' serum is the most potent readily available serum. Rettger thought that the loss of ability of serum to produce coagulation was due to a slowly formed, loose combination of the thrombin with the other constituents, and stated that serum that had lost its potency could be reactivated by the addition of weak alkalies or acids, with subsequent neutralization. Howell has confirmed this finding.

The dose of the animal serums intravenously is 100 c.c. and subcutaneously 10 to 50 c.c. every six to twelve hours. But of fresh human serum I have heard Dr. Willy Meyer say that he has repeatedly injected subcutaneously 400 or 500 c.c., and Judd has reported the use of 180 c.c. of the mother's serum in the case of a baby. It takes two to twelve hours to obtain the separated serum from fresh blood, and, according to Hess, twelve to twenty-four hours for the subcutaneous dose of a serum to influence clotting.

For want of available serum diphtheria antitoxin has been employed and in the past has been found useful, but the refined and concentrated antitoxin at present used contains a very high percentage of protein, about 16 per cent., and this almost entirely pseudoglobulins which have almost no value as coagulants. (Hess.)

Euglobulin. On account of the high protein in serum and its rapid deterioration as a coagulant, Hess separated the proteins and found euglobulin to be the important coagulative element. As euglobulin is only about one-third of the total protein a solution of it of the same strength as in the serum represents almost the total coagulative power of the serum with only one-third the percentage of protein. It thus gives a lessened chance of severe anaphylaxis. Hess passes it through a Berkefeld filter for sterilization and adds 0.3 per cent. of trikresol as a preservative. But it does not long retain its potency, and is not at present marketed.

Coagulose is a precipitate obtained by treating horse serum with a mixture of acetone and ether. It has the coagulative properties of horse serum and retains its potency for a long time. It is prepared aseptically and is kept dry in sealed glass bulbs containing 0.65 gram (gr. x) of the powder. It is made ready for use by the addition of 8 c.c. of sterile water, the temperature of which is not above

40° C. This amount, representing 10 c.c. of serum, may be employed subcutaneously, intramuscularly or intravenously. To make a satisfactory solution it should be dissolved by rotation of the bulb without shaking.

Blood serum and these derivatives lose their coagulative power when heated to a temperature of 60° to 70° C., therefore cannot be sterilized by heat.

Defibrinated Blood. The defibrination removes fibrinogen and blood-platelets, but Ottenberg and Libman state that in the process of defibrinating the blood cells are mechanically injured to some degree, so that their products are present in the defibrinated blood and if the introduced amount is large may cause intravenous clotting.

Whole Blood. The treatment of internal hemorrhage by the intramuscular or subcutaneous injection of whole blood in small amounts has recently been recommended (Curtis, Emsheimer, Howard), even amounts as small as 10 c.c. being employed. It would seem to us to have no value above that of serum, except that it may be used at once, while it practically forms a hematoma in the tissue with the usual slow absorption of the clotted blood.

Calcium as a coagulant is futile in these cases, for to affect the coagulability of the blood it must be given in huge doses for many days.*

Styptics. The local use of the chemical styptics, such as tannic acid, ferric chloride, Monsel's solution and alum, should be condemned, as they are irritant and tend to cause excessive peristalsis, nausea and vomiting.

VII. Measures to Restore the Blood Volume. In case the hemorrhage does not cease the volume of the blood is soon reduced so low that the mechanical functions of the circulation cannot be carried on. It is then necessary to add fluid to the circulating blood.

Transfusion. We have more faith in the transfusion of blood than in any other single measure, or in all the other measures put together, for it tends to fill the vessels with a liquid of the same physiological nature as that which has been lost, it prevents the lowering of viscosity which would otherwise take place whether the result of hemorrhage or of added saline, and it is not readily lost from the vessels by osmosis. For the transfusion I should prefer the syringe-cannula method of Lindemann or of Unger, for the sodium citrate method (Weil, Lewisohn) and the hirudin method (Satterlee and Hooker) involve the introduction of a substance that prevents clotting, and this would seem to be undesirable in a bleeding patient already much depleted of blood. However, in the use of sodium citrate this factor has proved to be a small one, so that if it is the only method available it may be employed. In using the citrate method I should recommend a strength of 0.25 per cent.

* For discussion see the author's Materia Medica, Pharmacology and Therapeutics, 2d edit., 1918.

of sodium citrate, as we have had clotting occur with the 0.20 per cent. strength recommended by Lewisohn. There are many reported instances in which the bleeding ceased quite promptly following or during transfusion. On the other hand there are cases in which bleeding seemed to recur because of the transfusion, and I might repeat the caution that if the bleeding has stopped the blood-pressure should be watched during the transfusion lest the clot be loosened by an access of pressure.

In severe hemorrhage Bernheim's rule is that transfusion should be performed if the systolic pressure drops to 70; and he affirms that the seriousness of the loss is not to be estimated by the percentage of hemoglobin. I would go further and say that if the hemorrhage seems to be continuous, or recurs in large volume, I should transfuse regardless of either the hemoglobin or the blood-pressure, for owing to the prompt action of the vasoconstrictors, the natural elasticity of the larger arteries, and the acceleration of the heart's rate which follows hemorrhage, the blood-pressure may be fairly well maintained for a time though the total volume of blood in the arteries is considerably less than normal. (Wiggers.) Likewise the hemoglobin drops only as the blood is diluted with tissue fluid. In any case of profuse hemorrhage measures should at once be taken to provide for transfusion, and in spite of Ottenberg and Libmann's warning against transfusion in acute first hemorrhages, I should say with Bernheim, "When in doubt transfuse."

Other Liquids. If there is no possibility of transfusion, salt solution, preferably of Ringer's or Locke's formula, may be introduced by rectum, by hypodermoclysis or intravenously. In its intravenous use it should be introduced slowly and its quantity limited to 1000 or 1200 c.c. Physiological salines do not interfere with the coagulation of blood (Crile) and may slightly stimulate the vasoconstrictor center (Pilcher and Sollmann), and where they are given to replace lost blood may maintain the blood volume for a sufficiently long period to save the life of the patient. But they have the disadvantage of increasing the volume but not the necessary blood elements, of decreasing the viscosity of the blood, and of changing its osmotic tension so that some of the fluid is before long lost to the tissues or excreted by the kidneys. But following hemorrhage this loss of fluid from the blood after saline is not nearly so rapid as when the blood volume has not been previously reduced. (Crile.) If the blood-pressure is very low, pituitary liquid or adrenalin solution, 15 minims (1 c.c.), may be added to the saline infusion fluid, the infusion being given very slowly.

Levin made a comparative study of the ability of saline solutions and transfused blood to replace blood lost by hemorrhage. In a number of dogs he let out enough blood to kill, allowing the heart to come to a standstill. When he replaced the lost blood at once with fresh blood by transfusion the heart began to beat again, and

in almost all cases the animal revived and in a very short time had returned practically to normal. When he replaced the blood with saline the heart began to beat again and kept it up for a time, but the animal did not revive. Of course in such a case there was proportionately an enormous amount of saline introduced.

To increase viscosity and thus prolong the value of added liquid other than blood, less rapidly diffusible colloid liquids, such as a solution of acacia, 5 per cent. in Locke's saline, as recommended by Hurwitz, or a 1 to 2.5 per cent. solution of gelatin in saline may be employed intravenously. Bogart, Underhill and Mendel found that after the introduction of colloidal gelatin solutions the blood retained the increased volume for an abnormal length of time. Gelatin is prone to contain putrefactive products and is less safe than acacia. Gelatin may also be used subcutaneously, and Lindberg has in this way introduced as much as 400 c.c. of a 10 per cent. solution daily.

To increase viscosity, Schreiber recommends 200 c.c. of 5 per cent. solution of glucose, though he has employed it up to 20 per cent. in strength. Kausch has used up to 2000 c.c. of 5 to 7 per cent. solution of glucose. Kuhn holds that glucose decreases coagulability.

VIII. Other Mechanical Measures. In case of extreme exsanguination it is wise to bandage the limbs, to raise the foot of the bed high, to keep the body warm and perhaps even to bind the abdomen tightly and put weights upon it after the method of Meltzer. For it is necessary to maintain the cerebral and coronary circulations at all costs or the patient will quickly die.

The use of an ice-bag over the stomach is customary and may favor contraction of the stomach. But the belief that the application of cold to the abdomen results in constriction of the splanchnic arterioles is disproved by the work of Tice and Larsen.

IX. Surgery. It is the consensus of opinion that while surgery may be called for in recurrent hemorrhages, immediate surgery is contra-indicated in the presence of a profuse hemorrhage. It has been estimated by Moynihan that not over 3 per cent. of profusely bleeding gastric or duodenal ulcers could be treated successfully by laparotomy. As a matter of fact, either spontaneously or because of or in spite of the medical measures employed, nearly all hemorrhages cease and are not fatal. So that by the time we have decided that the hemorrhage is not going to cease the patient is beyond the point of safety for an operation. Lindberg, of Faber's clinic in Copenhagen, tabulated 68 cases so severe as to raise the question of an emergency operation. It was decided in all the cases to give medical treatment. Only 5 of them died, and the autopsies showed that not one of the 5 could have been helped by surgery. These statistics, together with statistics from other clinics where operations were performed, convinced Lindberg that surgical measures are

never indicated in cases of acute hemorrhage from the stomach or adjacent bowel. Lund recently said: "I have learned that it is poor practice, when the patient is depleted by hemorrhage, to open the stomach and try to grasp the artery in the bottom of an ulcer."

SUMMARY. *The Aims in the Treatment of Profuse Hematemesis* are three, viz.: 1. To stop the bleeding. 2. To overcome its effects. 3. To prevent its recurrence.

The *Treatment* is:

1. Have patient very quiet, lying down, with head low, with a light ice-bag over the stomach and with plenty of fresh air.

2. Avoid unnecessary manipulation.

3. Give a hypodermic of morphin sulphate, 0.015 gram (gr. $\frac{1}{4}$) with strychnin sulphate 0.002 to 0.003 gram (gr. $\frac{1}{30}$ to $\frac{1}{20}$).

4. Immediately after vomiting give by mouth a solution of thromboplastin, kephalin, coagulen or epinephrin.

5. In a case not of the portal congestion type, if the stomach remains distended and the bleeding seems to persist, lavage with tepid water, and follow this by passing in a solution of epinephrin, thromboplastin, kephalin or coagulen through the tube. In portal congestion cases avoid lavage.

6. Prepare early for transfusion, and as soon as there are indications for it transfuse with careful watchfulness.

7. If there is severe exsanguination, bandage legs and arms, raise the foot of the bed, bandage and put weights on the abdomen, keep up body warmth, and furnish fluid intravenously, subcutaneously and by rectum.

8. If transfusion cannot be done give intravenously Locke's or Ringer's solution containing 5 per cent. of acacia.

9. Finally, have a surgeon at hand to share the responsibility, but do not operate.

To prevent recurrence inject subcutaneously every six to twelve hours for one or two days, 10 to 50 c.c. of human, rabbit or horse serum, or a solution of coagulose or euglobulin, or a single dose of 100 to 500 c.c. of human serum; or inject intramuscularly a solution of coagulen, thromboplastin or kephalin.

If recurrence happens, resort to surgery, if necessary, preceding the operation by transfusion, (*a*) after the bleeding has stopped, or (*b*) if the bleeding continues but has become persistently small in amount.

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THE DIAGNOSIS OF MITRAL STENOSIS.

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Of all valvular lesions, stenosis of the mitral valve is the most protean in its manifestations. It is most versatile in the way it exhibits itself, sometimes so cleverly disguised that one scarcely suspects the wolf behind the apparent, at other times so outspoken and brazen that a veritable beginner might recognize its true nature at once. Experience with the Cardiovascular Board has reëmphasized a former conviction that of all lesions of the heart valves,

mitral stenosis is the most difficult to diagnose, and hence the most instructive.

A text-book case, or what medical teachers characterize as a "third-year condition," meaning thereby one that is so manifest that even a tyro in medicine can recognize it, offers no difficulty, as the combination of a presystolic thrill, presystolic murmur, snappy first sound at the apex and accentuation of the second pulmonic sound, blaze so clearly the path to the correct diagnosis that none but those who will not see can lose his way. Unfortunately this type of case is not found so frequently in apparently healthy young men who present themselves for military service, as does the aberrant and unclassical variety, which, at hasty examination, often presents no murmur or thrill and whose detection is a matter of some difficulty even after prolonged study. It is the latter type of case that has been found rather frequently by the Cardiovascular Board at Camp Jackson. That we should meet with this subtle variety and not the classical one is not surprising, as the local boards are fully able to recognize the typical and the definite, and these individuals are quickly found to be unfit and are not distributed to the various camps, whereas the unusual cases may be passed undiagnosed.

In the diagnosis of typical cases of mitral stenosis, stress must be laid on the fact that failure to hear a murmur in the upright position should not prevent one from recognizing the valve defect if the quality of the first sound is studied. Particular emphasis has been laid on this point at Camp Jackson, and many cases have been rejected that ordinarily would have entered the service, with the great probability of being discharged later for physical disability. We have stressed particularly the quality of the first sound which oftentimes furnishes the clue to the diagnosis.

1. Quality of the First Sound. The first sound at the apex in a case of uncomplicated mitral stenosis is in the vast majority of instances so manifestly not the first sound heard in health that one's attention is immediately arrested. It is a first sound that is heard in no other condition so characteristically, and when it is heard it deserves careful study. It has a clear ringing note (not in the sense that it is musically vibrant), a snappy sound that defies description, but may be imitated by grasping the slack of a handkerchief in both hands and pulling it taut, or by tapping forcibly with a staccato blow of the finger the back of the hand, the palm being held tightly against the ear.

Palpation will recognize the forcefulness of the systole and the apex-beat will strike the hand sharply and immediately recede. This systolic shock at the apex is an important feature, particularly in those rather rare instances in which no thrill can be felt. It may be questioned whether similar phenomena are not encountered in other conditions, but there can be no question that when these phenomena

are perceived then the case should be thoroughly studied before one presumes to pronounce him as normal.

Misinterpretation of the foregoing is feared, with the impression resulting that all cases of mitral stenosis exhibit the loud snapping first sound and the systolic shock at the apex. This is not intended, as in the cases in which there is insufficiency as well as stenosis, the striking characteristics of the first sound are masked or lost and a murmur takes its place. Here again one's attention should be arrested long enough to examine the case at length.

2. Presystolic Thrill. This is held to be the most characteristic feature of mitral stenosis, but that it is not always present, and when present the case is not always one of mitral stenosis, there can be little doubt. A presystolic thrill that terminates in the sharp quick, receding shock of the first sound generally means mitral stenosis.

Recently Morris and Friedlander[1] have invited attention to a functional presystolic thrill unassociated with mitral stenosis. This type of thrill is felt best in the erect posture and is followed by reduplication of the first sound and a systolic shock. A presystolic thrill is sometimes found in cases of aortic insufficiency, but in this disease one misses the loud snapping first sound of a typical stenosis.

When the thrill is not appreciable in the upright position, as it frequently is not, it may be palpated with the subject in the dorsal, lateral or ventral decubitus. The latter is particularly useful, and several times the thrill has become definite when the patient lay on his abdomen, his head resting on his arms. The thrill is distinctly a thrill, with rapidly repeated vibrations similar to the thrill felt over the neck of a purring cat. The coarse fibrillating movement of the chest wall present in those individuals with thin chest walls, which is visible as well as palpable, must be differentiated.

The timing of the thrill is not always easy, but if one will observe the suprasternal or supraclavicular pulsations and remember that in most of the cases the systolic shock is distinctly palpable, little confusion need arise unless there is marked tachycardia. In the latter instance the thrill itself is difficult to detect.

3. Presystolic Murmur. The murmur of mitral stenosis is the most fugitive and elusive of any murmur of organic origin. It is variable from day to day, from hour to hour, and in one case of our series it changed its character within five minutes. It may be present one day and it may be impossible of detection the next. The more recent the damage to the valve the more varying is the murmur; the older the condition the more constant it is. The time of the murmur is diastolic, and arbitrarily dividing diastole into three parts the murmur may be early diastolic, middiastolic or late diastolic, or may

[1] Jour. Am. Med. Assn., 1918, lxxi, p. 375.

occupy the whole of the diastolic period. Another axiom may be expressed as follows: The more recent the valve defect the later the murmur; the older the condition the earlier. This has referenee to diastole and may be expressed as the nearer the murmur is to systole, or the nearer it is to a true presystole period, and the shorter it is in duration, the more recent the lesion; while the farther toward the beginning of diastole it is heard the longer the valves have been damaged.

The quality of the murmur is harsh, as is that of all stenotic lesions. When the murmur is definitely late in diastole (presystolic in time) it becomes more loud as it terminates in the loud snapping first sound (the characteristic crescendo presystolic murmur); or the murmur may be at the beginning of diastole, when it is diminuendo and of longer duration than the true presystolic murmur; or it may occupy the entire diastolic period, starting loud, becoming softer in mid-diastole and becoming more intense as systole is neared. To use a musical phraseology the murmur has a mid-diastolic diminuendo and a presystolic crescendo. These fine variations cannot be detected in a rapidly beating heart but can be well made out in typical cases, with normal pulse-rate.

This murmur should be sought for whenever the first sound has the snapping character mentioned above and may generally be heard if the following recommendations are observed: Not only in the upright position should one listen, but the subject should be examined when he lies on his back, side or abdomen, and in this last-named decubitus a flat bell of a stethoscope (phonendoscope) is very useful. All our suspected mitral stenosis cases we examine in the ventral position, which serves to bring out the murmur very clearly, especially when in other positions its detection was obscure. Exercise often brings out the murmur and auscultation following exertion should always be practised. Remembering the fickleness of the presystolic murmur and the relative constancy of the systolic shock or snappy first sound at the apex it behooves one to become early familiar with the characteristics of the typical first sound of mitral stenosis, so that when such a sound is heard his attention may be concentrated on the task of proving the diagnosis. It is not going too far to insist on the diagnosis of mitral stenosis in the absence of a murmur providing one has recognized the snappy first sound and not mistaken it for the booming of an hypertrophied heart, although no case in our series was diagnosed on this feature alone.

4. Accentuation of the Pulmonic Second Sound. In many of the cases of well-compensated mitral stenosis (no auricular fibrillation) the second sound at the third left intercostal space is accentuated and much louder than the aortic second sound unless the second sound is replaced by a Graham-Steell murmur. If there is any doubt about the interpretation of an apical first sound it is as

well to remember that if the sound is that of an hypertrophy of the left ventricle the second aortic will be accentuated, while if it is the typical snappy first sound of a mitral stenosis, the pulmonic will usually be louder than normal.

5. Blood-pressure. There is really only one valvular defect which is associated with fairly definite blood-pressure phenomena—namely, aortic insufficiency. Blood-pressure of itself is of no help in the diagnosis of mitral stenosis, but it has been interesting to note how frequently the pressure was above normal in stenosis and how rarely in insufficiency (well compensated).

6. History is ordinarily of great importance, although in our series rheumatic fever was by no means constant. In the army reliable histories are hard to obtain. Hemoptysis is a frequent symptom and should always excite suspicion.

Realizing the care that is required in many cases of mitral stenosis before a correct diagnosis can be made the Cardiovascular Board at Camp Jackson was instructed that with the draft increments special study of all abnormalities of the quality of the first mitral sound should be made, and all such cases, including cases exhibiting a diastolic murmur, no matter where it was found, were to be referred to me for detailed examinations. Those of us who have seen draft examinations can readily appreciate how difficult it is to devote much time to the study of the abnormal; it suffices to recognize the case as unfit for military service and to diagnose it, but further than this it is rarely possible to go. For this reason the cases noted above were withdrawn from the line and were brought to my office, where they would be away from the excitement of the examinations and where protracted study could be carried out in quiet surroundings. It was due to the skill and hearty coöperation of Lieutenants Harris, Byrnes, Feinglos, and Captain Hastings, of the special board, and of Captains Langhorst, Metzger, McDonald and Lieutenant Anderson, of the Depot Brigade, that the material for this paper was collected. In all 36 cases of mitral stenosis were diagnosed from a draft increment of about 15,000, 24 being "pure" cases and 12 associated with insufficiency.

Of etiological factors in the 24 cases of pure stenosis, rheumatic fever, chorea, tonsillitis and growing pains are the most important, although the history of growing pains we have found difficult to obtain, as few individuals have heard of this phrase. In some instances, rheumatic fever, chorea and tonsillitis appear together in an individual's history, and hence the total number of diseases given below exceeds the total number of cases, a discrepancy which is easily understood.

Rheumatism occurred 12 times, tonsillitis 10, growing pains 9, chorea 6; in one instance symptoms, chronologically speaking, were referred to an attack of pneumonia and diphtheria; in 12 individuals there was no history of previous infection (*sic*).

On physical examination following the outline of the Government form for cardiovascular examinations, cyanosis was observed 14 times, pallor 4 times and in 6 cases the appearance was negative as far as these two phenomena were concerned. However, we feel that the individual with stenosis has a somewhat characteristic appearance. He is rarely a large man, generally poorly developed, undernourished in aspect, and his face is drawn, the eyes look sick and there is a dusky, turgid appearance of his face and hands and coldness of the extremities. The board has individually come to recognize a stenotic facies, and men with this appearance were put aside for study even before they were palpated or percussed.

THRILL. A presystolic thrill ending in the characteristic systolic shock was felt 22 times. Not always was the thrill felt when the patient was erect, but generally the thrill was more definite when he lay on his back, and always the thrill and the shock could be well felt when the subject lay on his abdomen.

MURMUR. In all of the 24 cases a murmur was heard. Sometimes not in the erect posture but usually in the recumbent position, and always best in the ventral decubitus.

SNAPPY FIRST SOUND. This was heard typically 19 times; in the 5 cases in which it was not heard a systolic murmur, accidental or without significance, muffled it. The second pulmonic was found to be accentuated over the normal 15 times; in the 9 cases not accentuated a diastolic murmur was heard.

Hypertrophy of the heart was found in but 4 cases. Irregularities were found but once, and this was an extrasystolic arrhythmia. The systolic blood-pressure was sometimes quite high but the average of the 24 cases was 13.2 mm. Hg. The diastolic pressure was 78.

Cabot in 1914[2] published a paper on 200 autopsied cases and 116 not autopsied cases, which as regards numbers makes the 24 cases of our series appear insignificant. However, my series has the advantage of having been carefully examined by at least two men, especially trained in cardiovascular work, apart from my own examination, and has the further advantage that these cases were all ambulatory young adult males, who showed so few signs that they were accepted by local boards for military service. We agree with Cabot that cases of mitral stenosis are frequently undiagnosed, but we cannot agree that the average well-trained physician can diagnose only 50 per cent. If one relies on an examination of a few minutes only, omitting examining the individual in the erect, dorsal and ventral and lateral positions, omitting the examination after an exercise test, he will be fortunate if he can make correct diagnoses in even 50 per cent. of the cases. Cabot's conclusions are based largely on clinical records some twenty-two years old, and this is scarcely fair to the modern practitioner.

[2] Tr. Assn. Am. Phys., 1914, xxix, p. 22.

The diagnosis in some cases is most difficult, but in no case impossible, unless the auricle is fibrillating to such an extent that no diagnosis is possible other than fibrillation. The important features of an ambulant case, such as we are now seeing in the army, are a loud snapping first sound at the mitral area, presystolic thrill terminating in systolic shock, diastolic murmur generally late in diastole accentuation of the second pulmonic sound and absence of hypertrophy of the heart on percussion.

These palpatory and auscultatory findings should be carefully sought for before and after exercise, with the subject in various positions, and especially useful will be found the examination of the patient when lying on his abdomen. In the majority of the cases this serves to intensify the three cardinal features, the snappy first sound, the thrill and the murmur, a trilogy which is sufficient to permit of the diagnosis of mitral stenosis.

REVIEWS

A Manual of Otology. By Gorham Bacon, A.B., M.D., F.A.C.S., formerly Professor of Otology in the College of Physicians and Surgeons, Columbia University, New York; Aural Surgeon, New York Eye and Ear Infirmary. Assisted by Truman Laurance Saunders, Assistant Professor of Laryngology and Otology, College of Physicians and Surgeons, Columbia University, New York. Pp. 583; 204 illustrations. Philadelphia and New York: Lea & Febiger, 1918.

The author is to be congratulated upon such an excellent manual for students and general practitioners. The descriptions are short, clear, and to the point, and the author does not lose you in tiresome details. The descriptive anatomy is useful. The mastoid operation is suitably described, but might have better illustrations. The labyrinthine portion has much better photographs of the operation, and is interesting. The author has made of the Bárány reactions a condensed resumé, and to one uninitiated into the labyrinthine details his work is helpful. The adenoid and tonsil operation is valuable and timely. The book is up-to-date, and should prove useful to many physicians. N. P. S.

Manual of Histology. By H. E. Radasch, Assistant Professor of Histology and Embryology, Jefferson Medical College, Philadelphia. Pp. 580; 307 figures. Philadelphia: P. Blakiston Son & Co., 1918.

This is an expansion of the author's shorter book on histology, and is arranged under the same chapter headings. Thus the first chapter on technic, which occupied 31 pages in the compend, is here enlarged to 55 pages, and this enlargement is typical of all the subjects treated. Many additional illustrations have been selected from other works and some new ones, chiefly photomicrographs by the author, have been added. All these changes contribute to an increase in thoroughness of presentation, and in its enlarged form the book cannot fail to be more helpful to the seeker after histological information. W. H. F. A.

DISEASES OF THE NOSE AND THROAT. By WILLIAM LAMB, M.D., M.R.C.P., LOND., Honorary Surgeon, Birmingham Throat Hospital. New York: William Wood & Co., 1918.

THIS book, designed as an elementary work, contains many good points, and some not so valuable. It is small and compact, the subject desired is easily located, nearly all the operations are up-to-date, and the author endeavors to make the subject clear to the novice first, adding an excellent summary for the specialist. There are many good photographs of the cadaver which are suitable for anatomy study, but many more are needed to make the subject clear to a beginner. Especially is this true of the operations.

Most young medical men do better operating when they have photographs to guide them, and this book, unfortunately, has very few illustrations of operations, however minor.

It is strange to hear that the guillotine still has its advocates, while the better method of dissection is so lightly dwelt upon. The ear section gives many useful pointers, especially good is the plan of keeping the external canal aseptic. N. P. S.

SOME HEADACHES AND EYE DISORDERS OF NASAL ORIGIN. By GREENFIELD SLUDER, M.D., Clinical Professor and Director of Laryngology and Rhinology, Washington University Medical School, St. Louis, Mo. 115 illustrations. St. Louis: C. V. Mosby Company, 1918.

DR. SLUDER'S book marks a decided advance in medicine. It is a pleasure to find such a work which combines the clinical pathological and surgical findings. It has been my observation that the physician who is a pathologist in addition to being a surgeon is a more discerning observer and a much better trained operator, and Dr. Sluder is this rare combination.

The causes of headaches have long been a wilderness for the medical explorer, and many a skilful diagnostician has been caught in the mazes and failed to find the right path to the source of the disorders. Therefore, any work which offers new aids in throwing light into this difficult field of study is welcome. Fortunately, Dr. Sluder's book is not only a beacon light to the family practitioner, but is of great help to the surgeon, as it gives diagnostic pointers with complete descriptions of the operations, amply illustrated by excellent drawings.

Any competent rhinologist who has done modern surgery knows that Dr. Sluder's claims are well founded and deserving of the recognition they will receive. Moreover, the cures cited are real cures.

The turbinectomy operation is unique and well described, promising a quick and effective means of opening the ethmoid and frontal-cell drainage. The technic for injecting the sphenopalatine ganglion

gives minute details for this difficult procedure and will help many young rhinologists over a rough road.

The author gives many case histories, with sufficient data to explain his methods of reasoning, and these should aid other physicians with doubtful cases to arrive at a correct diagnosis. The text is amply illustrated with cuts near the subject, the descriptions are clear and the operations well described, and other old methods are fortunately omitted. Indeed, the book is a most welcome addition to any rhinologist's library, and will afford an evening of pleasure to any well-informed surgeon. N. P. S.

PRINCIPLES AND PRACTICE OF INFANT FEEDING. By JULIUS H. HESS, M.D., Professor and Head of the Department of Pediatrics, University of Illinois College of Medicine. First edition. Pp. 338; 20 illustrations. Philadelphia: F. A. Davis Company, 1918.

ORIGINALLY intended as a hand-book for his students, Professor Hess has presented the *Principles and Practice of Infant Feeding* in a clear and practical manner in this little volume, which will doubtless recommend itself highly to the general practitioner.

Its simplicity of style and its lucidity of meaning reduce the difficulties connected with infant feeding to an irreducible minimum.

Dr. Hess very wisely and rightly lays much stress on the great value and importance of breast milk for the young infant.

In the absence of the mother's milk the employment of a wet-nurse is advocated and the management of the wet-nurse is presented in considerable detail.

In treating the subject of nutritional disturbances the views and classifications of Czerny and Finkelstein are closely followed. An index and a very helpful appendix greatly increase the usefulness of the book. J. H. S.

CHEMISTRY OF FOOD AND NUTRITION. By HENRY C. SHERMAN, PH.D., Professor in Columbia University. Second edition, rewritten and enlarged. New York: Macmillan Company, 1918.

IT is a satisfaction to be able to welcome unqualifiedly such a publication as the *Chemistry of Nutrition*, by Henry C. Sherman, the second edition of which has just appeared. To students of the general topics of metabolism and nutrition, and particularly to internists who want a survey of these fields, this volume should prove of real value.

In studying a large and intricate subject like the physiology of nutrition, it is useful to approach it from several angles in order that what is obscurely or imperfectly expounded by one author may perhaps be more easily and intelligibly grasped through the writings

of another. The opportunity afforded by this book to establish new contacts in this difficult field should therefore be utilized by all who appreciate a terse and dependable presentation of the scientific evidence at hand. The work is an epitome more of the views of others than of those of the author, and it has the outstanding merit of full presentation without such refinement of detail as to make the text difficult of comprehension.

The author discusses the foodstuffs and the digestive processes in the usual order, and these subjects occupy the first third of the book. The fate of the foodstuffs in metabolism and an excellent consideration of calorimetry and its practical application are next presented. Space is then devoted to mineral metabolism and the general topic of foodstuffs in their relation to the deficiency diseases. In two appendices are provided a classification of proteins, and tables giving the usual data of the composition of foodstuffs at large.

Each chapter is followed by a considerable list of references. The book as a whole is modelled somewhat after Dr. Lusk's classical work on the *Science of Nutrition*, but those desiring an easier approach to or briefer review of this subject will peruse the present work to their advantage. It should also serve as a reference work of no small value to all except specialists in this field. R. P.

GYNECOLOGY. By WILLIAM P. GRAVES, M.D., Professor of Gynecology at Harvard Medical School. Second edition. Pp. 883; 490 illustrations. Philadelphia and London: W. B. Saunders Company, 1918.

IN his preface to this edition, the author states that the book is designed as both a text-book and a general reference book on gynecology. Its completeness of detail makes it unusually fit for both these purposes. The volume, as a whole, has been enlarged by 115 pages. These additional pages include 100 new illustrations. The subject-matter is divided into three parts:

Part I is devoted to the physiology of the pelvic organs and their relation to the different elements of the general organism, including the various glands of internal secretion. This section gives the results of recent investigations in this still undetermined field. An abstract of Loëb's recent work on the corpus luteum appears in this connection, also the very interesting results of ovarian transplantation. The question of organotherapy also is discussed to some extent in this connection. The author makes one feel the close relationship which really exists between the work of the gynecologist and that classed specifically under neurology and psychiatry. He quotes Havelock Ellis as saying: "These facts of morbid psychology are very significant; they emphasize the fact that even in the healthiest woman, a worm, however harmless and unperceived, gnaws periodically at the roots of life." In this second part, too,

an entirely new section has been added, presenting the relation of gynecology to the Freudian theory of sexuality.

Part II is devoted strictly to gynecological diseases, including inflammations; new growths, both benign and malignant; defects of development, as well as the normal embryology of the urogenital tract; malpositions of the pelvic organs; injuries due to childbirth; also a group of special gynecological diseases and a section on general symptomatology.

Part III gives a very complete description of the surgical aspects of gynecology. This is not confined to the generative organs alone, but includes operations on the abdominal wall for hernia, operations of the kidney and ureter, also operations on the bladder and rectum. In closing there is a brief, but very practical, chapter on the technic of examinations and the essentials of postoperative care.

The illustrations, both half-tones and microscopic drawings, are excellent in every case, being particularly free from the diagrammatic and unreal qualities which characterize the illustrations seen in many text-books. Those in Part III, illustrating the operative procedures, are done by the author himself, and aid particularly in emphasizing and elucidating his methods of operative technic. Altogether, the book succeeds admirably in meeting the needs for which it is designed. Moreover, it not only satisfies the general needs of the gynecologist, as such, but also presents much valuable information in the field of general abdominal surgery. M. G.

TRANSACTIONS OF THE AMERICAN UROLOGICAL ASSOCIATION. 1917, Vol. XI. A Collection of the Papers Presented before the Society, April 2, 3 and 4, 1917. Pp. 353, with a number of illustrations and photographs. Brookline, Mass.: Riverdale Press, 1918.

THE *Transactions* represent the investigations of urologists in all sections of the country and present their thought on symptomatology, diagnosis, operative technic, laboratory investigations and new instruments. Thomas in describing how surgical intervention may be needed to cope with chronic prostatitis, after giving case reports, concludes with: "(1) Chronic prostatitis may be and is at times a surgical disease, requiring prostatectomy for its most efficient treatment; (2) chronic prostatitis is not infrequently associated with hyperplastic, polypoid, papillary or nodular formations of the mucosa of the prostatic urethræ and vesical orifice, demanding removal by treatment coincident with that directed to the prostate; (3) fulguration or high-frequency spark promises to offer the best method of intra-urethral treatment for this purpose." Young and Frontz in discussing the treatment of the lower genito-urinary tract with radium declare that its use in the treatment of carcinoma of the prostate and seminal vesicles in many cases has resulted not only in

marked symptomatic improvement, but in definite reduction of the size and the consistence of the tumor. Pelonze describes certain bodies, which he calls lymphoid bodies, in the prostatic urethra and declares these to be evidence of tuberculosis. His findings if true are very important. The summary of his case records is: (1) There are many cases of advanced urogenital and pulmonary tuberculosis in which these lesions are not present. They have, therefore, no negative value. (2) They are not peculiar to the male. (3) At least 80 per cent. of these patients were in apparently robust health and had never been suspected of any form of tuberculosis. (4) I am of the opinion that these bodies appear very early, and they apparently persist throughout the entire course of the tuberculosis. They have been found in the mildest as well as the most advanced phases of the disease. (5) Sufficient time has not elapsed to venture an opinion as to prognosis, but it has been abundantly impressed upon me that most of these patients do very well if local treatments to the urethra and protate are avoided and antituberculosis treatment is instituted. O'Crowley and Martland report 13 cases of new growths of the testis, and following out the teaching of Ewing, declare that for practical purposes there exists only one tumor of the testicle, namely, a teratoma. B. A. T.

THE WASSERMANN TEST. By CHARLES F. CRAIG, Lieutenant-Colonel, Medical Corps, United States Army. First edition. Pp. 239; 3 colored and 10 half-tone plates. St. Louis: C. V. Mosby Company, 1918.

THIS monograph on the Wassermann test describes in simple and clear language the principles of this important test and the technic of the author, which is a modification of the original Wassermann and Noguchi tests, and which is employed in most of the laboratories connected with the Medical Department of the Army. The numerous and valuable contributions to our knowledge of the Wassermann test which have been made by the author and his colleagues are well known and the results are summarized in this monograph, with numerous references to the more important investigations of others during recent years. The results and interpretation of the Wassermann tests in the various stages of syphilis and the effect of treatment upon the reaction are presented clearly and briefly as based mainly upon the personal experience of the author. The concluding chapter is devoted to the Wassermann test, with cerebrospinal fluid and an interpretation of the results, together with brief descriptions of the technic and practical value of other examinations as the colloidal gold test, cell counts and protein tests. The book will doubtless prove of considerable value to both laboratory worker and clinician and go far toward removing certain prejudices entertained against this valuable test. J. A. K.

PROGRESS
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MEDICAL SCIENCE

MEDICINE

UNDER THE CHARGE OF

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Clinical Report of Non-specific Protein Therapy in the Treatment of Arthritis.—SNYDER (*Arch. Int. Med.*, August, 1918). In his series of 110 cases the author used typhoid vaccine prepared by the laboratories of the New York Board of Health, indicating, however, that any protein (bacterial, animal or vegetable) may be used. In acute arthritis about 60 per cent. of cases responded by an abrupt termination after one injection (intravenously). After repeated injections in subacute cases marked improvement followed in about 50 per cent., and moderate improvement in another 25 per cent. While in chronic cases (one to ten years' duration) "moderate improvement in mobility of some joints was noted in almost all cases."

Studies in Thyroid Therapy.—JANNEY (*Arch. Int. Med.*, August, 1918). Subjects of these experiments were patients who were able faithfully to adhere to a prescribed weighed diet and accurate in collection of urine and feces. They were placed in separate rooms in a special metabolic ward under specially trained nurses, were allowed no other treatment (except fresh air, walking and rest), and were under observation from three to thirty-five weeks. Dietaries employed were calculated on the basis of Meek's weight-height formula and all food was sampled and analyzed for nitrogen. The thyroid hormone used was prepared and furnished by E. C. Kendall (Mayo Clinic): *Control* experiments were conducted on two twelve-year-old girls (diagnosis: fully compensated endocarditis) and a woman aged twenty-five years

(diagnosis: mild neurasthenia). The earliest observable effects of minute doses of thyroid was a tendency for the positive nitrogen balance to diminish, with diets containing either normal or decreased amounts of nitrogen. The author regards this action as toxic. Cretin Experiments: Subject, a typical cretin of twenty years of age. On a well-mixed diet (2192 c.) of 50 cal. per kilogram patient was given daily 0.5 gm. of fresh gland. Clinically the improvement was marked. There was a jump in nitrogen balance of 100 per cent. and increase in weight. On a *low protein* high carbohydrate diet (2192 cal.), with the same medication, the patient lost weight and there was only a slight gain in nitrogen balance (over athyroid periods). On a bare maintenance mixed diet (*a*) without thyroid weight was lost and nitrogen balance approached zero, (*b*) with thyroid nitrogen balance leaped to 1.32 gm. daily, and there was marked clinical improvement. The author here concludes: "The identical amounts of thyroid which caused nitrogen loss with or without toxicity in normal individuals led to a large gain in nitrogen accompanied with improvement in the clinical condition in the case of the cretin. The therapeutic action of the thyroid is therefore anabolic and constructive, not catabolic and destructive.' Three cases of exophthalmic goitre were studied in similar manner. The improvement noted was not ascribable to thyroid medication. In drawing a deduction from the pure metabolism experiments the author concludes for cretins that "a high protein or a high carbohydrate diet is less advantageous than a mixed diet containing rationally balanced amounts of protein, carbohydrate and fat." Cases of exophthalmic goitre the experiments showed "the most favorable diet was one in which protein, fat and carbohydrate are present in usual proportions but in increased amounts." As an explanation of the cause of exophthalmic goitre the author presents the theory of a toxic degeneration of normal thyroid hormone when present in the body in excess, pointing out that "many or all the toxic symptoms of Graves's disease may appear in connection with (1) pathological changes in the thyroid gland; that is exophthalmic goitre; (2) as a result of administration of thyroid material or thyroid hormone in excess to normal myxedematous or thyroidless human beings, or animals." Regarding treatment of exophthalmic goitre the author concludes: "In accordance with previous experience the thyroid treatment of toxic cases is inadvisable." On the other hand, cases showing deficiency symptoms should receive judicious thyroid treatment, using about 0.25 mg. hormone iodin corresponding to 4 grains of thyroid tablets.

WAR MEDICINE NOTES

Prognosis in Trench Nephritis.—DYKE (*Lancet*, September 7, 1918) has analyzed the after-history of 50 patients, up to periods of within twelve months from the onset of acute symptoms. The original clinical observations were made at a base hospital in France and the later records were obtained from the home hospitals to which the patient had been transferred. The prognosis with regard to life is very good, as

of the 50 patients but 1 died, and he from scarlet fever. The prognosis with regard to perfect restoration to health is fair, as 29 out of the 49, approximately 60 per cent., made a return to complete health. In the other 40 per cent. the health of the patients was permanently damaged. The prognosis becomes worse with increase in age. In persons under thirty-five years the probabilities are strongly in favor of complete restoration, in persons over thirty-five the likelihood is that permanent damage will remain. Arteriosclerosis is not a common immediate result of the condition. No constant distinctive eye changes were recorded. In every case but one the edema disappeared before the albuminuria. The edema usually disappears during the first week, but its persistence during the second week is common. Its persistence after the second week renders the prognosis increasingly unfavorable. The albuminuria, on the other hand, does not cease usually until toward the end of the first month or during the second month. It may persist during the third month and the case still end favorably, but its continuance after the end of the third month renders the prognosis as regards restoration to complete health unfavorable. The author believes that the condition known as trench nephritis differs little from nephritis met with in civilian practice, except in the greater frequency of its occurrence, and that it is either a primary acute nephritis or an exacerbation of preëxisting disease, induced by continued fatigue and exposure.

W. H. F. A.

Symptoms of Acute Cerebellar Injuries Due to Gunshot Injuries.—Holmes (*Brain*, December, 1917) has been able to examine over forty men, during the present war, who had wounds limited to the cerebellar regions of the brain. These showed injuries of different extent and localization, some of them resembling closely the experimental injuries of the cerebellum on which the classical physiological descriptions of this organ are based. Twenty-one of these patients, in whom the symptoms were pronounced, were under his observation sufficiently long to permit of repeated examination and investigation. As a result of this study he aims to describe those disturbances of function which constitute the symptoms of recent cerebellar lesions as objectively as possible and to attempt to analyze complex symptoms into their simpler components. In the majority of patients who survived the lesions were unilateral, involving chiefly one lateral lobe of the cerebellum, and the author's descriptions are based largely on these cases. One of the most prominent symptoms in the early stages of an acute lesion is the loss or diminution of tone in the muscles of the homolateral limbs and to a less extent in those of the trunk on the same side. During the first week or two, striking features are the flabbiness of these muscles to palpation and the ease with which they can be stretched or compressed, and the affected limb placed in unnatural attitudes, without any discomfort to the patient. This cannot be attributed to loss of sensation, as repeated examinations fail to show such loss. This flabby hypotonic state of the muscles, in extensive unilateral lesions, is always limited to the same side, and is usually more pronounced or at least more easily demonstrated, in the upper than in the lower limb. Associated with this flabby, toneless condition of the limbs the patients complain of weakness in voluntary movements of these muscles. The feebleness is always more pronounced in the arm than in the leg, and when tests are repeated

it is found that the affected limbs tire more quickly than those of the opposite side. There is apparent reluctance on the part of the patient to move the affected arm, and when moved there is almost always a marked slowness of the movement as compared with that of the arm on the uninjured side. This slowness is seen not only in initiating the movement, but also in attaining the exertion of full power and in commencing and effecting relaxation. When, however, corresponding muscles of the two limbs are stimulated simultaneously by a faradic current no slowness in either their contractions or relaxations can be detected, and there is no difference in the latent periods of the contractions of the muscles when these are excited reflexly. The author finds that this asthenia is always more evident in the early stages of the injury and diminishes gradually. This condition of asthenia due to cerebellar wounds is distinguished from that produced by lesions of the cortical motor area or of the corticospinal tracts by its homolaterality, by the uniform and the approximately equal affection of all groups of muscles, by the fact that though all voluntary movements are weak none are limited in range and by the fact that there is no tendency for rigidity or contractures to develop. The most commonly recognized sign of cerebellar disease is the so-called ataxia. This irregularity or disturbance of voluntary movement is quite as marked when the patient's eyes are open as when they are closed. In the early stages all movements of the limbs are affected, but the disturbance is more striking in the upper than in the lower limb, and in complex than in simple movements. One patient's explanation of his difficulty in touching finger to lips was as follows: "I do not seem to have the power to do what I want to with my right hand, though if I take hold of anything with it I can grip it all right. If I want to bring it to my mouth I only hit my eye with it; it is drunk; it will not go straight." The performance of a complicated action by stages, by decomposing the movement into its separate elements, was seen even in patients making their first purposive movements, when still suffering from the early general effect of the wound. This suggests that this decomposition of movement is not always a willed device by which the patient attempts to diminish the inaccuracy of the limbs. Asynergia and dysmetria are striking abnormalities in the affected limbs. Tremor is not such a prominent factor in the early as it is in the later stages of a cerebellar lesion. In many of the serious cases no tremor was noted during the movements of the limbs. Deviations from the line of movement are always seen in recent injuries. Thus one patient found that when he attempted to feed himself with the affected hand it was frequently to his ear that he brought the food, and another that he could not use this hand in smoking as he was afraid of putting the cigarette into his eye. The "rebound phenomenon" was easily demonstrable in all cases with moderate or severe lesions. Thus when the patient's elbows are supported on a table and he is asked to pull each hand in succession toward his mouth against resistance offered by the observer who grasps his wrists; when this resistance is suddenly released the hand of the affected side flies to his mouth or shoulder, often with considerable violence, but the movement of the normal limb is arrested almost immediately. This phenomenon is always more pronounced in the early and acute stages of a cerebellar injury and diminishes gradually as improvement sets in. Adiadochokinesis, the inability to execute

alternate movements as quickly and correctly as normal persons, can usually be demonstrated at all joints of the affected limb even when only limited lesions exist, but it is usually more pronounced in the arm than in the leg and in complex than in simple actions. During recovery the slowness, irregularity and awkwardness diminish gradually, but adiadochokinesis is one of the most persistent of the ordinary signs of cerebellar injury. Static tremor is, as a rule, seen only in the affected limbs as they become tired. Giddiness is an extremely common symptom after all gunshot injuries of the head, but rarely persists for more than one or two days. This fact throws doubt on the necessary relationship of vertigo to cerebellar lesions. In testing for spontaneous deviation of the limbs with the eyes closed it was found in practically all cases that there was deviation outward by the limb on the injured side. Abnormal attitudes, so striking in Luciani's animals after experimental lesions of the cerebellum, are much less constant and striking in man. As a rule the head tends to be flexed toward the side of the wound and rotated toward the opposite side, so that the chin approaches the contralateral shoulder and the occiput is approximated toward the shoulder of the affected side. It is noticeable, too, in some cases that the limbs did assume unnatural attitudes or would be placed in postures which the patient would tend to avoid in a normal limb. When a patient who is able to leave bed is placed on his feet his whole body sways irregularly and he is usually in considerable danger of falling, expecially toward the side of the wound and backward. Nevertheless, he can generally maintain his equilibrium. The patient can stand as well with his eyes closed as when they are open. When with eyes open his attention is diverted, even if only by conversation, he becomes more unsteady and is in greater danger of falling. When he attempts to walk he has even greater difficulty in preserving his equilibrium, though almost all men with unilateral lesions succeeded in walking unaided on the first day they left bed; this varied between eight and seventy-one days after the infliction of the wound. In walking along a straight line he deviates more or less toward the affected side. These difficulties in walking and standing seem to be connected with the disordered condition of the muscles of the affected side. Many have regarded the cerebellum as an organ concerned mainly with the maintenance of equilibrium, but this hypothesis finds no support, according to the author, in the examination of these men. When a man who has recently left bed attempts to progress on his hands and knees he exhibits a very striking similarity, both in attitude and progression, to a dog or monkey after ablation of one-half of the cerebellum. Nystagmus is a very common symptom and of the greatest clinical importance. The eyes while at rest are generally deviated toward the opposite side, usually 10 degrees to 30 degrees to the unaffected side of the middle line. When the patient looks at an object held directly in front of him his eyes tend to deviate to the unaffected side and are brought back to the rest-point by sharp jerks of small or moderate range. On looking toward the injured side the nystagmus is more pronounced, the rate of the oscillations as observed in several patients ranging between twenty-three and thirty years in ten seconds. As time goes on the nystagmus becomes less regular and less characteristic, although it may persist for weeks or even months. As this nystagmus was present even when the wound was small and relatively

superficial it is extremely probable that it is due to damage of the cerebellum alone and not necessarily to involvement of the labyrinth or of Deiters's and Bechterew's nuclei. Speech is affected in most cases in which the lesions are recent and severe; in fact, in a few patients speech was unintelligible for a time. The speech has a "sing-sing" character, slow and drawling, but at the same time tending to have a scanning effect. A striking feature is the apparent effort necessary to utter a series of syllables or a sentence, this being associated with excessive facial grimacing. Often many syllables were uttered explosively. These defects improve rapidly, as a rule, but may persist for even two or three months. Striking alterations in the reflexes are not prominent or very obvious symptoms, although in unilateral lesions the reflexes may sometimes be unequal. The change can be seen best in the knee-jerk. In a few cases during the acute stages of the illness this was absent on the side of the injury but normal on the other side. In other cases the homolateral jerk is at first feebler and less easy to elicit. No differences were detected in the superficial reflexes. No disturbances of sensation were found. Nor was there any disturbance of the nervous mechanism for appreciating and discriminating weights. Though the patient often could not compare correctly weights placed at the same time in his two hands a series of tests on the difference-thresholds for the two hands showed there was no loss or defect in the appreciation of weights on either side. The inability to compare the two weights with the two hands is attributable to the impaired condition of the muscles themselves of the injured side. No case was seen in which the vermis alone of the cerebellum was injured, but cases were studied in which the vermis and one lateral lobe were injured. In these cases the symptoms did not differ in nature from those in lesions of one lateral lobe, though in extent of the damage the functional disturbances are somewhat greater and recovery less rapid when the vermis also is involved. The only special features of vermis injury noted were greater difficulties in speech, more pronounced tremor and greater difficulty in movement of the head and trunk when the patient sat up. No new symptoms were found when both sides of the cerebellum were injured, but the symptoms were bilateral and consequently there was much greater functional derangement of all muscular activities; speech was practically unintelligible and the patients could not sit up or even hold up the head unaided. In regard to the subject of functional localization in the human cerebellum the author believes that the experiences of this war will probably settle the question. Although he finds that his observations lend no support to the theory of focal localization in the cerebellum cortex, he does not believe the problem to be finally solved. W. H. F. A.

Effect of Exercise upon Undernourished Men.—JANSEN (*Deutsch. Arch. f. klin. Med.*, December, 1917, cxxiv, 1). *Abstract:* According to the author the official ration of the town of Munich contained in March, 1917, 1600 calories and 9.7 gm. of nitrogen, which is the equivalent of 60.6 gm. of protein. This ration was given to several men who were occupied as interns in the medical clinic of Friedrich von Müller and nitrogen balance experiments were carried out upon them for six to thirty-one days, after the manner of Chittenden. Prior to the experiments the men had been for some time on short rations, especially as

regards the protein element. It is stated, however, that the average loss in weight since the war began was about 5 kg., which certainly does not indicate excessive emaciation. The average weight of the subjects was 62 kg. While partaking of the above diet each man lost weight daily and also very nearly 2 gm. of nitrogen. This loss was attributed to the deficiency of calories in the dietary, for the addition of 500 calories in the form of sugar resulted in maintenance of the body weight as well as in nitrogen equilibrium. *Translation:* All the previous experiments were made upon people who were either inactive or were doing light work only. It remains to consider the behavior of the nitrogen metabolism of people who accomplish heavy work when partaking of an insufficient diet. The subjects, Ebert, Legène and Beholz, abstained from muscular exertion during three days and then they walked together over level ground distances of 18, 20 and 25 km. (11, 12.5, 16 miles) on three successive days. This was accomplished in a driving snow storm, while underfoot there was mud and melting snow, so that tramping was exceptionally difficult and wearisome. The diet remained the same throughout the experiment and contained 60 gm. of protein and 1628 calories, the official Munich ration of the time. The labor of making such a walk was in itself not excessively great and yet the subjects returned home each day overfatigued and exhausted. Each of the subjects, one one occasion, was forced to drive home in a wagon during a part of the return journey, so great was the fatigue experienced. One of them (Ebert) on his return fell into a state of prostration through weakness. The skin was pallid, respiration shallow and quickened, pulse small and slow, temperature subnormal, profuse sweating from the whole body surface; there was no acetone in the urine. Another of the subjects (Legène) gave indications of similar symptoms on the second day. Apathy and psychic depression were present in all three men during the evenings of these days of exertion. The experiments present two different findings as far as the protein metabolism is concerned. In one person the protein metabolism was not increased as the result of the muscular work. In the other two persons the nitrogen deficit increased about 1 gm. daily above the increase which accompanied the low calorie diet. This corresponds to an increase of about 10 per cent. in the total protein metabolism. These results may be thus summarized:

TABLE SHOWING THE RESULTS OF INSUFFICIENT FOOD DURING PERIODS OF REST AND EXERCISE IN MAN.

Subject	Period	Food. Calories	Food. N.	Excreta, N.	Body, N.
Ebert	Rest	1630	9.61	11.83	−2.22
	Work	1628	9.54	12.70	−3.16
	Difference				−0.94
Legène	Rest	1630	9.61	11.55	−1.94
	Work	1628	9.54	10.76	−1.22
	Difference				+0.72
Beholz	Rest	1630	9.61	10.81	−1.19
	Work	1628	9.54	11.78	−2.22
	Difference				−1.03

The average weight of the three men was at this time 57 kg. A complete explanation of this increase in the quantity of protein metabolism is not yet possible. . . . Two of the men (Legène and Ebert) were subjected to respiration experiments twelve hours after the second and third days of walking. These experiments had to be carried out at so late an interval because the persons concerned were too exhausted on their return from their walks to be satisfactory subjects for experimentation. Both experiments yielded surprising results, both as regards the duration of the after-effects of the exercise and the height of the metabolism. . . . In the present series of experiments high respiratory quotients were found twelve hours after the walk was finished. Although the height of the respiratory quotients fell during the progress of the experiment the average of all the determinations was about unity. The explanation of this high value lies in the irritable condition of the subject. The subjects who had formerly yielded themselves freely to this form of experimentation no longer had either the willpower or the physical energy requisite for accomplishing an exact experiment and fell into a state of excitement, which was manifested by the increased respiratory movements. The ventilation of the lungs was abnormally increased. There must have been materials circulating in the blood which acted as stimuli upon the respiratory center. . . . To what extent organic acids are responsible for this phenomenon remains for further experimentation to decide. (*Translator's note:* The average increase in the basal metabolism of Legène after exercise amounted to 50 per cent., or from about 1440 calories to 2160 for twenty-four hours. The smallest measured increase in a single determination amounted to 30 per cent. It is evident that resort to unrationed foodstuffs must have been necessary in Germany at this time for the preservation of the power to do physical work.) G. L.

Premiere Seance Consagree a la Biologie De Guerre.—Major W. B. Cannon, United States Army, makes the following the basis for discussion of traumatic shock: 1. Persistent low arterial pressure: This depression is the central and peculiar feature of shock and is a measure of its degree. 2. Concentration of corpuscles in capillaries: The difference between capillary and venous erythrocyte counts in shock may be as much as 2,500,000 corpuscles per centimeter (Bethune observations). 3. Concomitant variations of the degree of shock and body temperature: The blood-pressure falls as the shocked man becomes cold and rises as he is warmed. 4. Reduction of the alkali reserve, *i. e.*, of the sodium bicarbonate of the blood in many cases of shock: The reduction is often so great as to constitute acidosis in Van Slyke's definition (Bethune observation). 5. A correspondence between the degree of reduction of the alkali reserve and the degree of lowering of arterial pressure in shocked men. 6. Damage to the circulatory control: If a low blood-pressure has lasted a long time, nothing will cause a permanent rise of blood-pressure (Dijon experiments clinical observations). 7. A marked sensitiveness of a shocked man to ether or chloroform anesthesia, which induces a dangerous reduction of an already low pressure (Bethune observations and Dijon experiments). 8. A tolerance of nitrous oxide and oxygen as an anesthetic without fall of blood-pressure (Bethune observations and Dijon experi-

ments). The explanation of these facts is as follows: 1. The low blood-pressure is due to cardiac weakness, for if arterial pressure is raised by adrenalin or by cerebral compression the ear works effectively against the high-pressure. It is not due primarily to lack of vasoconstrictor tone, for raising the blood-pressure by aortic compression in a rabbit with a cervical sympathetic cut on one side results in the flushing of the denervated ear, but not of the ear still connected with the medulla (Seelig and Joseph). 2. The low pressure is explicable as a consequence of blood being out of circulation or stagnant on some part of the vascular system (anemia). The anemic blood is not in the abdominal veins as commonly supposed (see testimony of British surgeons, *Lancet*, 1917, ii, p. 727). It is not in the arteries, for in that case arterial pressure would not be low. 3. Concentration of blood in capillaries: The observation suggests that the "lost blood" of shock may be largely stagnant in capillaries, concentrated there by extravasation of lymph. Concentration is seen also in shock produced by injection of histamine (Dale and Laidlow). 4. Variation of shock with body temperature: Cold causes an accumulation and concentration of corpuscles in the capillaries. The blood count is higher in a cold than in a corresponding warm part of the skin. Cold therefore would augment the anemia of shock and warmth would diminish it. 5. Reduction of the alkali reserve: This results from too great lowering of arterial pressure. If the pressure is lowered to 80 mm. of mercury by lessening cardiac inflow through increased intrapericardial pressure there is no reduction of the alkali reserve; if lowered to 70 mm. the reserve begins to decrease; if lowered to 60 mm. it decreases more rapidly (Dijon experiments). Records of human cases made at Bethune confirm these experimental observations. A "critical level" in a falling blood-pressure lies at about 80 mm. of mercury, systolic pressure. As arterial pressure falls the circulation rate is slower and the oxygen supply to the tissues is less. Inadequate supply results in partial oxidation, with development of lactic acid (Araki) and with consequent reduction of the alkali reserve. 6. The lower the arterial pressure the lower the alkali reserve: From the foregoing considerations this result is to be expected. 7. Damage to the control of the circulation: Nerve cells are specially sensitive to oxygen-lack. If blood-pressure continues below the critical level sensitive structures are injured. Vasoconstrictor tone gradually diminishes (Erlanger). Finally, transfusion or infusion causes no permanent rise of pressure; the effect is that seen after the medulla is destroyed (Dijon experiments). 8. Sensitiveness to ether: The injured vasoconstrictor center is further depressed by the anesthetics, ether and chloroform, and blood-pressure consequently drops to a lower level.

Cause of Shock.—1. It is not due primarily to loss of vasoconstrictor tone for reasons stated above. 2. It is not due to fat embolism, for: (*a*) too much fat is required to check the flow of blood through the lungs (2 c.c. per kilo in dogs); (*b*) venous pressure in man is not raised as in experimental fat embolism; (*c*) the peculiar hyperpnea or apnea seen in experimental fat embolism does not occur in man. 3. It is not due to "acapnia." The excessive respiration demanded by this theory is not seen in human cases. 4. Evidence that it is due to the effect of tissue injury (experiments in coöperation with Bayliss and at Dijon; *Cf.* Delbet, Quenu); (*a*) the crushing of muscles in a hind leg is followed

by a fall of arterial pressure beginning in about twenty minutes and reaching in about an hour a shock level; (*b*) the effect occurs even though nerves to the leg are severed; it is therefore not of nervous origin; (*c*) if the bloodvessels (iliac artery and vein) of the leg are tied and the muscle injured the pressure drops only after the blood flow is restored; (*d*) if a shock pressure has been caused by muscle injury, tying the vessels may be followed by a progressive rise of pressure to the normal level; (*e*) the effects of muscle injury may pass away with spontaneous recovery of pressure; (*f*) the lowered pressure after injury is not primarily due to extravastion of blood and lymph into the injured tissues. The measured amount is insufficient.

Application of the Foregoing.—Considerations to the treatment of shock. 1. Every effort should be made to check loss of body heat from the shocked man and to restore to normal a lowered body temperature. Avoid exposing the body; use hot drinks, hot-water bottles, blankets and hot air. 2. Raise as soon as possible an arterial pressure, which persists below the critical level, in order to avoid the damage from oxygen want. 3. Use preferably transfusion of blood to raise pressure, for thus, in addition, oxygen carriers are added to the circulation. In the absence of blood use Bayliss's gum-salt solution, which raises pressure (by increasing volume) and thereby causes more rapid circulation and better employment of the corpuscles as oxygen carriers. 4. Use a tourniquet to separate a shattered, useless part from the rest of the body. Apply it as near as possible to the injured region, amputate proximal to the tourniquet and before removing it. If a tourniquet, used to stop bleeding, is to be left in place for a long period apply it at the most distal effective location. The surgeon must be guided in his decision to save or sacrifice the part by questions of viability and gross infection in the excluded region and danger to the rest of the body from its retention. 5. If ether is used in operating on a shocked man, begin to raise his blood-pressure by transfusion of infusion as soon as the anesthetic is started and continue the process during the operation. Use preferably nitrous oxide and oxygen, in a ratio not exceeding 3 to 1, preceded by morphin. Avoid always deep anesthesia and cyanosis. (The Bethune observations were published in reports to the Subcommittee on Shock of the English Medical Research Committee and in the *Jour. Am. Med. Assn.*, February 23, March 2, 1918. The Dijon experiments have not been published in detail.) P. R.

THERAPEUTICS

UNDER THE CHARGE OF

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Botulism: A Further Report of Cases Occurring in the Pacific Coast States.—Dickson (*Arch. Int. Med.*, 1918, xxii, 483) reports that prior to September, 1917, there were 23 recorded outbreaks of botulism in the United States in which 87 persons were poisoned and 58 died. In

addition to these there were at least 6 instances in which domestic fowl were poisoned and showed symptoms identical with those produced experimentally by feeding with the toxin of Bacillus botulinus. Of the 25 instances of poisoning of human beings or domestic fowl in which the source of poisoning was determined, 17 were shown to have been caused by the ingestion of home-canned vegetables or fruit. Since September, 1917, there have been at least ten additional outbreaks of botulism affecting human beings and four affecting domestic animals. Of these fourteen outbreaks, thirteen were due to the eating of home-canned vegetables or fruits, and from six of these the Bacillus botulinus was recovered. In six of the outbreaks the victims were poisoned simply by tasting the contaminated material and in several others the poisoning was caused by salad prepared from uncooked home-canned vegetables. It is probable that the various methods employed in the home-canning of vegetables, etc., are efficient in preventing ordinary spoilage, but they are inefficient if the raw material happens to be contaminated with the spores of Bacillus botulinus. These outbreaks indicate that it is unsafe to eat or even to taste home-canned products before boiling, the toxin of Bacillus botulinus being rapidly destroyed by heat. Dickson points out that it is of the utmost importance that those who are directing the home-canning industry should recognize that the present methods are not entirely safe. Since the toxin of Bacillus botulinus is quickly destroyed by heat the authorities should instruct the people that the danger of poisoning from home-canned products can be avoided if all such food is boiled before it is eaten or even tasted.

Value of Amyl Nitrite Inhalations in the Diagnosis of Mitral Stenosis.—Morrison (*British Med. Jour.*, April 20, 1918, p. 452) emphasizes the importance of excluding from the army all men suffering from mitral stenosis. While the diagnosis of advanced cases is relatively simple the diagnosis of incipient cases is more difficult. These early cases do not complain of subjective symptoms, and reliance must be placed on physical signs. Accentuation of the first sound and accentuation and reduplication of the second are the most reliable of the physical signs of incipient mitral stenosis, but are often present in "irritable heart." The differentiation between these two conditions is essential. A presystolic murmur or thrill, or both, is the positive and crowning sign of mitral stenosis. In the absence of one or the other it is inadvisable to make a diagnosis of this lesion. Among patients very near the borderline there are a number who present no suggestion of mitral stenosis when examined standing but who show unequivocal signs when lying down. There are a number who present inconclusive signs when standing, but signs of stenosis become clear in the recumbent position. A further group exhibit no conclusive signs on standing or lying. In these the diagnosis becomes clear when they lie after exercise. At the Military Heart Hospital all cases are auscultated standing and lying and lying after exercise. Amyl nitrite is used as a further test. Its action, like that of exercise, is to increase the flow of blood through the *A–V* ring, a change which favors the production of the murmurs in question. Amyl nitrite inhaled from a 3-minim capsule (until a reaction is evident) will often bring to light a clear presystolic or full dias-

tolic murmur in a patient lying on his back who had exhibited no murmur previously. It will therefore render an early mitral stenosis diagnosible. In some instances a presystolic murmur disappears under amyl nitrite. It is suggested that such a murmur is not due to mitral stenosis, but is a Flint murmur associated with aortic regurgitation.

Clinical Study of the Frequency of Lead, Turpentine and Benzin Poisoning in Four Hundred Painters.—Nearly one-half of all the 402 painters examined by HARRIS (*Arch. Int. Med.*, 1918, xxii, 129) gave evidence of active or latent lead poisoning. All the men examined were engaged in indoor work. Harris classifies the cases as follows: Group I 163, or 40 per cent. Active cases of lead poisoning in which the clinical symptoms spoke frankly for saturnism. Lead was demonstrated in the urine of 65 per cent. of these. Group II. 35, or 8.7 per cent. Latent or inactive cases. In these the clinical symptoms were few, but lead was invariably present in the urine. Group III. Borderline cases in which the clinical findings were suggestive. Group IV. Normal cases. Colic was present in over one-half of the active cases. It was complained of in 3 latent, 9 borderline and 8 negative cases. The severity, frequency and duration of the attacks varied greatly. In some cases the colic would last for as long as forty-eight hours. Magnesium sulphite seemed to be the cathartic of choice and in some cases a daily dose was taken as a prophylactic. Headache occurred in 46 per cent. of the active cases; it was usually severe and frontal in type. Only 3 cases of lead paralysis (wrist-drop) were found. Diminution in muscular strength was noted in over one-half of the active cases. No psychoses were found. The "lead line" was found in only 14 per cent. of the active cases. Harris believes that the blue line on the gums, supposed to be so characteristic of plumbism, is of little significance and is rarely found in those who apply reasonable oral hygiene. Lead was demonstrated in the urine in 65 per cent. of the active cases and in all of the 35 latent cases. The author emphasizes the importance of examining the urine for the presence of lead in the diagnosis of lead poisoning. Granular degeneration of the red blood cells was of rather infrequent occurrence, and, like the lead line, is not considered by Harris to be of much diagnostic value. Marked anemia and loss of strength were very common, occurring in 42 per cent. of the cases. Arteriosclerosis was found in 26 per cent. while evidence of nephritis occurred in 8 per cent. of the cases. Heart irregularities associated with myocardial degeneration were found in 11 active cases. Backache was an extremely common symptom though whether this was due to plumbism or to the strain on the muscles resulting from posture, the author was unable to determine. He did not find that lead poisoning interfered with the Wassermann reaction. Bronchitis was a very common complaint. The author believes that this is due in part to the inhalation of turpentine, benzol and other volatile substances used in painting. Of the pregnancies occurring among the wives of these painters, from 20 to 25 per cent. terminated in miscarriages. The home conditions of nearly all of the painters were found, on the whole, to be good. This does not support the theory that saturnism is due to poor social conditions. The use of alcohol did not appear to be a predisposing cause in lead poisoning. The article closes with a series of sane recommendations for the prevention of occupational diseases among painters.

OBSTETRICS

UNDER THE CHARGE OF

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Is the Purgation of Patients just before Operation Justifiable?—ALVEREZ (*Surg., Gynec., and Obst.*, June, 1918) states that some purgatives are irritant poisons which must be removed quickly from the body; this interferes with intestinal absorption and upsets the balance of salts, both cause pathological conditions and weaken the body. The dehydration of the body and the disturbance of the balance in salt is known to be bad, especially before an operation, after which there may be hemorrhage and vomiting. When magnesium sulphate is given there may be an increased amount of fluid in the bowel which greatly complicates any operation upon the intestines. In operations upon the colon liquid contents are much harder to control than solid masses. When purgatives act there is an increase of bacteria in liquid feces and increase in absorption of toxins, and more bacteria are absorbed through the mucous membrane. Undigested food may be carried into the colon to supply increased food for bacteria. The even flow of material from the stomach to the anus is disturbed by making some parts of the bowel weaker than normal and thus more irritable. Thus purgatives cause flatulence and disturbance, and when the bowels move frequently during the night, loss of sleep results. This is especially trying for a patient wearing a large cast or with a broken leg or other painful lesion, which causes suffering when the patient moves. Should there be intestinal obstruction a gangrenous appendix or badly diseased Meckel's diverticulum, or adhesions forming around pus, purgation may directly cause death. Purgation causes the bowel to react so poorly to drugs that after operation it may be difficult to meet postoperative emergencies. When the bowel has been emptied by starvation and purgation it is difficult for the colon to resume its normal activity; it must be filled and distended to a certain extent before it will empty itself of its contents. Children and nervous women sometimes begin vomiting during the night before the operation showing that the purgative which has been given causes the beginning of the trouble, and etherization usually causes it to become active. The suggestion is made that food be given as late as possible before operation, that only enemas be used before operation and that these be avoided if not absolutely necessary. That water and solid food be given by mouth as soon after operation as possible and that purgatives be avoided both before and after operation whenever this can be done.

Puerperal Septic Uteropelvic Thrombophlebitis.—TURENNE (*Surg., Gynec., Obst.*, June, 1918) reports the case of a multipara suffering from puerperal septic infection, upon whom he operated. In the right broad ligament a thrombosed uterine vein was found and also

thrombosis in the veins of the left broad ligament extending into the spermatic zone, no infiltration of the cellular tissue was observed. Owing to the location of the lesion the right hypogastric vein was ligated and ovarian vein on the left. The first was tied about the level of the promontory and 3 cm. of the posterior median line. The tie was made about 1 cm. beneath the bifurcation. The ligature was made near to the pelvic wall and there was slight bleeding as the stitch passed through the thickness of the broad ligament. In addition to this measure a fixation abscess was produced; the patient had a very painful congestion about the joints coinciding with the development of the fixation abscess. The abscess was incised and the patient began to improve. She finally made a good recovery and the thrombosed veins all disappeared, with the exception of a small-sized vascular cord, which was a remnant of the vein. The writer believes that puerperal septic thrombophlebitis has signs, symptoms and clinical evolutions which should call attention to its development. In more than half the cases there is a tendency to recovery, but the high mortality justifies modern methods of treatment. Surgical intervention by ligature is rational and the transperitoneal route is the preferable one. It is advisable to ligate all efferent venous trunks of the genital zone. It is very rarely necessary to resect or evacuate the thrombi in these veins. The results obtained from direct intervention on the thrombosed veins have been sufficiently encouraging to warrant new attempts at operation to fix definitely the field of operation. When there is permanent bacteremia, when the thrombi are inaccessible and when there is pyemic fossi in the viscera, operation on these veins is not indicated.

Status Epilepticus in Pregnancy.—TOMASILLI (*Annali di Obstetricia*, 1917, No. 41, p. 135) writes concerning the resemblance between epilepsy and eclampsia. He describes the case of a patient, aged twenty-five years, five months pregnant, admitted to the hospital under the suspicion that she had eclampsia. On obtaining the history it was found that she had previously had convulsions. The patient had eleven typical convulsions during the first twenty-eight hours after entering the hospital, and these, with the history and negative results in examination of the urine, made the diagnosis of epilepsy probable. The patient was kept in bed and treated by the free use of bromide, with the result that the convulsions ceased and the patient went to term and was delivered normally. As a rule, pregnancy does not increase the severity of epilepsy, but, on the contrary, epileptic women are sometimes better in health during pregnancy. The differential diagnosis is obtained upon a thorough and careful examination of the urine and an accurate history of the patient.

Severe Nosebleed Complicating Pregnancy. — SOLOMONS (*Med. Press*, 1918, No. 105, p. 123) described the case of a young woman, pregnant for the first time, who had had several slight attacks of nosebleed. When seen by the writer the nose was bleeding profusely. The blood-pressure and urine upon examination were normal. Treatment with coagulose, adrenalin and gauze packing was unsuccessful for five days. About two days after the nose was tamponed, labor terminated in the birth by forceps of a dead female child weighing $5\frac{3}{4}$ pounds. The

child was slightly macerated. On the following day the packing was removed from the nose after having been in place about two and a half days. During the first week of the puerperal period the patient had slight fever, but was able to leave the hospital at the end of the third week.

Double Uterus with Torsion of One Cornu.—Mazzini (*Semana Med.* 1917, No. 24, p. 630) describes the case of a primipara, aged twenty-two years, who was brought to the hospital suffering from labored respirations, pale and with a facial expression indicating some abdominal complication. There was rapid pulse, fever, dry tongue, thirst, vomiting and pyrosis. The abdomen resembled pregnancy at full terms, the fundus being on the left side and well up toward the ribs. The uterus was irregular in contour and the height of the fundus was 33 cm., which did not coincide with the apparent period of the pregnancy. Palpation of the abdomen gave no clear information. On questioning the patient she stated that the abdomen had enlarged suddenly about two hours before entering the hospital. Examination showed a septum commencing at the vulva which gave the appearance of two vaginæ. On palpating on the right side there was apparently connection between this and the left uterus. On section the half of the uterus pregnant was practically at term, very dark in color and with a distinct torsion. This was opened, emptied of its contents and removed. Its cervical pedicle was sutured and covered with peritoneum. The patient was convalescent in twenty days; her wound healed by first intention. On opening the uterus, which had been removed, it contained a well-developed fetus. The placenta had been attached normally, but partially separated and there had been hemorrhage.

Injuries of Labor.—Skeel (*Cleveland Med. Jour.*, 1918, No. 17, p. 83), from his records of obstetric patients examined from two to six weeks after birth, this writer finds that in many instances, although the patient seemed in good condition immediately after labor, she will develop some abnormal state of the genital tract. He divides these injuries into those of the pelvic floor and outlet, the cervix and vault of the vagina and the ligaments supporting the uterus. He calls attention to the necessity of interrupting pregnancy if the patient goes over term, so as to avoid serious injury at birth. Some of the worst lacerations are produced by posterior rotation of the occiput and the delivery of the head in that position. The pelvic wall is split into the ichio rectal fossæ, and this injury is not readily discovered unless a speculum and good light are available. When the patient bears down strongly during labor the head impinges against the upper portion of the levator ani muscle before the perineum itself is in danger of laceration. When the pubic arch is narrow the tendency to laceration is still greater. Ether anesthesia should be used to the point of relaxation when the perineum is very tense. When the bladder prolapses it is not uncommon to have the uterus share in this process. The bladder will prolapse through the anterior portion of the triangular ligament if this be torn and the uterus will follow it. In closing the perineum the muscles and fascia should be united separately with buried catgut sutures, using a Graf needle, and then closing the mucous membrane and skin subse-

quently. To avoid undue strain upon the catgut it is well to use additional stitches of silkworm gut. In closing the cervix attention must be called to the necessity of bringing together the upper angles. In order to be successful, such repair should be undertaken in those cases only which are free from active infection or from gonorrhea. Retroversion after labor is very frequent and every effort should be made to prevent its development. To prevent this patients should avoid strain, and during labor the attendant should avoid severe pressure on the fundus. During the puerperal period the patient should be encouraged to turn frequently in bed. The patient is also advised to lie upon the abdomen whenever she can. A vaginal examination is made about two weeks after labor, and if backward displacement of the uterus is found the knee-chest posture is ordered and later the womb is put in position and a suitable pessary is introduced. The longer the patient has had this complication the greater the chance of relief by surgical interference.

Treatment of Retention of the Placenta.—Bassewitz (*Semana Med.*, 1918, No. 25, p. 85) reports 2 cases in which he tried the new method of hydraulic separation of the placenta introduced by Gabaston. The method consisted in injecting into the placenta by the umbilical vein, sterilized salt solution sufficient in quantity to distend the placenta and the excess fluid forms a retroplacental hydroma. This greatly facilitates the delivery of the placenta. In the first case the placenta was expelled, its fetal face presenting, in five minutes; in the second case it was necessary to remove the placenta by the hand. When the uterus is in a condition of inertia or when there are adhesions between the placenta and uterus this method seems a good one. It is not reliable in cases of partial lateral detachment of the placenta. Should the placenta be inverted or attached over the point of entrance of the Fallopian tube the method may cause serious complications.

Joined Twins.—Salmond (*Lancet*, 1918, No. 194, p. 295) reports the case of a monster child born to parents natives of Natal. The mother had previously given birth to two healthy children and was aged twenty-seven years. In the delivery of the child there was no complication and no physician attended her. When seven days old the monster was seen and successfully photographed; it died on the next day. Both bodies were female and presented normal external genital organs, but urine was passed from only one; there were two anal openings, but the contents of the bowel escaped from only one. The two joined children took food separately and cried without reference to other, so one would remain awake while the other slept. The two hearts did not beat synchronously and respiration was independent in each child. There was but one umbilical cord. There was normal movements of four arms and two legs; there was one limb formed by two fused legs and on the leg were nine toes. At the ankle- and knee-joints there was not much evidence of movement, which was absent at the hip. The skeleton of the child could not be obtained for examination.

Dangers of Pituitrin.—Marchand (*Bull. Med. Assn., of Puerto Rico*, San Juan, March, 1918, No. 118, p. 14), states that midwives have learned the action of pituitrin and often use it indiscriminately;

severe lacerations are caused and one case is described in which four injections had been given; when the physician was summoned the patient was moribund, lying in a pool of blood, with the inverted uterus entirely expelled from the body. A similar condition was present in another case, but the uterus was reduced, which was followed by violent bleeding. This patient, a primipara, had received three injections when dilation had scarcely begun.

The Blood in Eclampsia.—SLEMMONS (*Am. Jour. Obst.*, May, 1918) has examined the blood of eclampsic cases. He finds that the analysis in eclampsia and auto-intoxication shows a normal quantity of amino-acids and a slight reduction of nitrogen waste products as urea and uric acid. There is an increase of the sugar in the blood after convulsion, but the total fat is approximately the same in toxemia and normal pregnancy. Cholesterol is increased in eclampsia and lecithin is diminished. The number of the blood plasma and combined carbon dioxide is reduced in normal pregnancy, which would indicate a mild acidosis, and the variations met with in auto-intoxication are insignificant. The results of blood analysis do not support the acid hypothesis nor the derangement of protein metabolism hypothesis of eclampsia, and indicate that the cause of the disease must be sought elsewhere.

Surgical Conditions Complicating Extrauterine Pregnancy.—MUSSEY (*Am. Jour. Obst.*, May, 1918) gives statistics upon this subject from the Mayo Clinic. From 1914 to 1916 inclusive there were more than 10,000 abdominal operations upon women at the Mayo Clinic, and among these 253 pregnant women were found to have definite surgical lesions not dependent on although associated with the pregnancy. Of these, 138 were advised to have operations and 123 were operated on. Sixteen patients went to operation with pregnancies which had not been diagnosticated; one of these was three months advanced, but most of them were under two months. During the same period there were 130 pregnant women with surgical complications who did not come to operation; in 56 of this group the pregnancy was under three months, 61 between three and five and in 13 more than five months. Appendicitis in pregnancy is a frequent occurrence and to be dreaded because of its danger to mother and child. More than 2 per cent. of all pregnant women have appendicitis. An acute attack of appendicitis during pregnancy calls more strongly for operation than does an attack in non-pregnant patients, as the danger of abortion of general peritonitis or rupture of the appendix is greatly increased. In 100 cases there were 9 miscarriages, 2 of which were terminal events from other causes. It may be stated that in general practice every fifth or sixth pregnancy in private practice ends in abortion. In the series quoted there were 1 abortion after appendectomy, 1 after operation for appendix and gall-bladder, 3 after single oöphorectomy and appendectomy, 1 each for enucleation of uterine fibroid tumor and removal of the thyroid gland and 2 following operation upon the gall-bladder and appendix; 4 of these abortions occurred under two months, 2 at two months, 2 at three months and 1 at four months. In the 50 patients operated on within three months' gestation there were 14 miscarriages, or 45 per cent.; between three and five months, 4.4 per cent. There were 5

pregnancies of more than six months in which there were no abortions. The complication in pregnancy second in frequency to appendicitis is inflammation of the gall-bladder, of 2215 women having gall-bladder operations during the period mentioned 26.17 per cent. were pregnant. Those patients having gall-stones or gall-stone pain which are not presenting dangerous symptoms should not be operated upon during pregnancy. In the 26 gall-stone operations there were two deaths and one miscarriage. Pelvic tumor is an important surgical complication of which there were 8 associated with pregnancy and 18 in the patients not operated on. Fibroid tumors not presenting appreciable symptoms, and in such a position as not to obstruct the birth canal at the time of delivery, should not be disturbed during pregnancy. Myomectomy in pregnancy is a dangerous operation. Of the 20 patients with fibroid complicating pregnancy examined in the Mayo Clinic in three years, but 3 were operated on; 1 of these had an abortion. Ovarian tumors complicating pregnancy are very important because they may give rise to a dangerous condition through twisting of the pedicle or rupture of the cyst and obstructing delivery. In the 253 cases in the Mayo Clinic were 6 ovarian tumors, of whom 5 were operated on; in each case a single ovary was removed, in 1 case there had been an ovarian abscess and infection of the tube, abortion followed in this case as in 2 other cases. In 1 case a diagnosis had been made of pregnancy associated with a large uterine fibroid but the patient was found to have an ovarian cyst eight weeks after a normal delivery. Other operations were amputation of the breasts, nephrectomy, removal of hemorrhoids, partial removal of the thyroid and in 1 case an operation on the cervix; this patient was sent with a diagnosis of sterility having apparently menstruated normally three and a half weeks before; pregnancy was not interrupted and the patient went on to normal delivery. There were 2 radial amputations of the breasts for carcinoma, 1 six and a half months and 1 seven months pregnant, without interrupting the pregnancy. In 3 other cases adenoma was removed from the breast; none of these had abortion. In 1 case a tuberculous kidney was removed without interrupting pregnancy; 35 pregnant women with adenoma of the thyroid were examined and 31 advised to delay operation until after confinement; 6 patients having exophthalmic goitre were pregnant, of whom 4 were operated on, but in only 1 a primary thyroidectomy done. There were 1055 women having exophthalmic goitre, of whom about 0.5 per cent. were pregnant, of 2404 women with simple goitre only 1.4 per cent. were pregnant. The writer concludes that the operation that can be postponed until after confinement should not be done during pregnancy; when necessary the appendix can be removed during pregnancy without undue risk to mother and child. It is not often necessary to operate on fibroid tumor complicating pregnancy, but when necessity arises there is but little risk. It is safer to remove an ovarian cyst complicating pregnancy than to allow it to go on. It is thought to be more favorable if operation is performed in the first half of pregnancy, but should necessity arise it may be done in the second half as well. In the experience of the reviewer pregnancy and parturition are especially liable to cause chronic appendicitis to become acute, hence the appendix should be removed in all pregnant women so soon as the diagnosis of appendicitis is made. Operations upon the

kidney, in the experience of the reviewer, have been limited to drainage but this has been successful without the interruption of pregnancy. In one case of colon bacillus infection he removed the appendix and drained the kidney at the same time without interrupting pregnancy and the patient made a good recovery. Infection of the gall-bladder is far from uncommon among pregnant women, and it is the opinion of the reviewer that such cases should be operated on so soon as pregnancy is over provided they do not become acute, in the presence of acute and severe infections there can be no question about the necessity of immediate operation.

Gall-bladder Disease Complicating Pregnancy.—WHITE (*Am. Jour. Obst.*, May, 1918) reports the case of a woman, aged twenty-two years, who had been operated on twice because of gall-stones and jaundice. Five years later she was admitted to the hospital, supposedly in labor. She had suffered from persistent vomiting during the greater part of pregnancy, and six weeks before admission she began to have pain in the region of the gall-bladder and was jaundiced. On examination the uterus was enlarged to full term; fetal movements could be felt and the fetal heart could be heard. There was marked tenderness over the gall-bladder, and on vaginal examination the cervix was long, hard and undilated. The patient was not in labor and her pain was evidently caused by some condition in the gall-bladder. At the end twenty-four hours the patient was much worse, and it was decided to empty the uterus first by abdominal section and then to explore the gall-bladder. On section the uterus contracted with difficulty and the child was stillborn. The gall-bladder was found much enlarged, with many adhesions, and contained mucopurulent bile; no stones were discovered. A drainage tube was sutured in the gall-bladder and the drainage of bile persisted for twenty-nine days. The wound was entirely closed at the end of thirty-five days, the patient making a good recovery. A pure culture of Bacillus pyocyaneus was obtained from the contents of the gall-bladder.

GYNECOLOGY

UNDER THE CHARGE OF

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Absorption of Drugs and Poisons through the Vagina.—As a war time contribution which may assist in the lowering of both maternal and infant mortality, MACHT (*Jour. Pharm. and Exp. Therap.*, 1918, x, 509) has been carrying on a series of investigations in the pharmacological laboratory at Johns Hopkins University on the absorption of drugs and poisons through the vagina and has reached the following conclusions: (1) It has been shown that a large number of drugs and poisons—alkaloids, inorganic salts, esters and antiseptics—can be and are easily absorbed through the vaginal wall. (2) Such absorption can be demon-

strated experimentally by physiological and chemical means. (3) A review of the clinical and toxicological literature shows that poisoning through the vagina, of a grave character, is not very rare. (4) The experiments indicate, on the one hand, the possibility of administering drugs therapeutically for their constitutional effects, through the vaginal route; and on the other hand, emphasize the great danger of the indiscriminate employment of various poisonous substances in the form of douches, tampons, "uterine wafers," etc. The investigations were carried out upon cats and dogs. In some cases the substances were identified by chemical means after their absorption, in some the pharmacodynamic and toxicological effects were taken as proof of the action of the substances upon the body, and in other cases, both physiological and chemical evidence could be obtained.

Repair of Complete Rectovaginal Lacerations.—HAYNES (*Ann. of Surg.*, 1918, lxvii, 501) has recently described an operation which he performed in January, 1916, for the repair of a total division of the rectovaginal septum from the cervix to and through the perineum. While his method is very similar to that described by Lignen in 1903 for the treatment of high rectovaginal fistula, the literature on the treatment of complete rectovaginal lacerations is so scanty that the steps of Haynes's operation, which are essentially as follows, deserve our attention: (1) Begin the separation of the rectum from the vagina just above the levatores ani and in the space between the rectovaginal fascia and the rectum. (2) Separate the bowel downward through the anal canal and cut through the mucocutaneous junction. Carry the mobilization of the bowel upward high enough to obtain sufficient sound rectum so that the undamaged rectum may be drawn beyond the level of the skin. (3) Divide the anococcygeal tissues sufficiently far toward the coccyx to permit suturing the retracted sphincter ani externus in front of the rectum. (4) Rotate the rectum through 90 degrees and suture it in place, especially reforming the attachments of the levatores ani to the bowel. Trim off the excess of rectal tissue and suture the skin to the rectal mucosa. Drain the region behind the rectum. (5) Complete the operation by a perineorrhaphy.

Preliminary Report of an Operation for Cystocele.—RAWLS (*Am. Jour. Obst.*, 1918, lxxvii, 359) has elaborated a technic for operation upon cystoceles which, he feels, promises to restore the anatomical relations in the bladder and to prevent the many abnormal conditions which frequently result as the after-effects of cystocele operations by offering a strong and anatomical restoration of the supports of the bladder without causing anteroposterior shortening of the anterior wall of the vagina. His method may be used in all forms of cystocele, but in cases with complete prolapse of the uterus, other additional methods are required to relieve injury to the posterior segment of the "holding apparatus" and the injury to the "supporting apparatus." The technic of Rawls's operation is as follows: A small volsellum forceps is applied to the mucous membrane of the anterior vaginal wall about 1 cm. above the cervix and another forceps about 1 cm. below the external urethral orifice. Between these forceps a vertical incision is made through the mucosa and superficially into the underlying tissues. These cut edges

are retracted and the incision carried forward until the midportion of the bladder is reached. It is then continued downward until the cervical attachment of the bladder pillars and the so-called uterovesical ligament are demonstrated. The latter is cut with scissors, keeping well in midline in order to avoid severing any of the cervical attachments of the bladder pillars. The bladder is next separated by blunt dissection as far up as its peritoneal reflexion from the cervix and well out to either side, care being taken to free it from the underlying pillars upward to the urethra. If there is an urethrocele the dissection is carried up to the external urethral orifice. When the bladder is well mobilized its pillars are dissected from the underlying vaginal mucosa. The next step must be done carefully in order to avoid destroying or buttonholing the fascial sling. With a finger under the mucosa as a guide, the thinned-out fascial edge is dissected with a knife from the underlying mucosa. The mucosa flap is made paper-thin and forceps are applied as tractors to the fascial and mucosal edges. This cutting dissection is continued from the midline, downward and upward for a short distance laterally until a distinct line of cleavage can be demonstrated the whole length of the primary incision, after which further separation by blunt dissection is secured from the overlying pillars well out on either side to the "arcus tendineus." The bladder and its true lateral ligaments are now freely mobilized and the latter are overlapped from side to side by transverse mattress sutures of kangaroo tendon, one or two sutures entering the cervical tissue at the level of the internal os. These sutures prevent anteroposterior shortening of the anterior vaginal wall and draw the underlying fascia smoothly under the overlapping fascia. The cervical suture reattaches the fascia to its original place on the cervix and forms a shelf on which the bladder rests. The free edge of the overlapping fascia is then closed over the underlapped fascia by interrupted kangaroo tendon sutures. The thin vaginal mucosa flap is now excised for a short distance on either side and its edges approximated in midline by interrupted chromic catgut.

Cystoscopic Study of the End-results of Various Forms of Cystocele Operation.—The condition of the interior of the bladder after cystocele operations has never been given special consideration, attention having been centered principally on restoring the anterior vaginal wall to an apparently normal state by an operation which would insure a permanent result. The interior of the bladder must necessarily be very tolerant, since symptoms seldom develop until infection has occurred, even though, as has been found by BROUN and RAWLS (*Surg., Gynec., Obst.*, 1918, xxvi, 502) in their recent cystoscopic studies, the base of the bladder is thrown into folds and sulci in most instances after cystocele operations. The question naturally arises as to whether such a condition does not render more possible some after disturbance of a systemic character. In their cystoscopic studies, the authors have noted that the kind of operation seemed to have no effect upon the degree of distortion of the base of the bladder. In anchoring the bladder base to a higher plane with sutures, attaching it to the broad ligament, proportionately as many abnormalities were produced as by the other method of leaving the bladder free after its separation from the uterus and bringing together the tissues underneath it. The ideal operation should not only

provide a permanent vaginal restoration of the prolapsed anterior wall, but should also leave the base of the bladder in the normal plane. The authors believe it is the degree of anterior prolapse which decides whether the base of the bladder is left in a normal or convoluted state. Patients with only a moderate prolapse, upon whom a small area of separation of the mucosa was done, seemed less susceptible to extensive folding of the base than those with an extensive prolapse and proportionately larger separation. Rawls is of the opinion that if due care is exercised in preserving the fascial pillars of the bladder when separating the vaginal mucosa, and equal attention is devoted to freeing the bladder from these pillars and from its uterine attachment, equally good results will be obtained in all degrees of cystocele, not only as to the vaginal aspect, but also in a minimum of folding of the base of the bladder, if not its complete absence.

Treatment of Cystocele and Uterine Prolapse during the Childbearing Period.—According to WATKINS (*Surg., Gynec., Obst.*, 1918, xxvi, 570) the essential features of such an operation are wide incision anterior to the cervix, free separation of the herniated part of the bladder, closure of the hernial opening by circular sutures, restoration and fixation of the urethrocele and perineorrhaphy, while amputation of the cervix, trachelorrhaphy, plastic surgery on the broad ligaments and vaginal fixation are adjuncts which may be frequently utilized. The following are the procedures, as outlined by Watkins, to be used singly or collectively, according to the needs of the case: Transverse Incision: The transverse incision in front of the cervix should extend freely across the anterior vaginal wall to permit the cervix to tilt easily upward and backward as the operation progresses. This lengthens the anterior vaginal wall and allows the body of the uterus to drop forward without undue flexure. The anterior vaginal wall is often congenitally or otherwise shortened in these cases. Separation of the Anterior Vaginal Wall from the Bladder: Blunt dissection with Mayo scissors saves time and lessens bleeding and traumatism if care is taken to find the plane of fascia between the vagina and bladder. The width of separation varies. It should not be wide enough to endanger the ureters or injure large veins, yet should include all redundant mucous membrane and should permit complete separation of the herniated part of the bladder. Separation of the Bladder from the Cervix: This is also most satisfactorily done with scissors if caution is taken to find the dividing plane of fascia. The herniated portion of the bladder should now be completely freed from the sac. The peritoneum is incised if the cystocele is large, if intraperitoneal exploration is desired, if the uterus is retrodisplaced, or if vaginal fixation of the round ligaments is contemplated. At this time amputation of the cervix, if indicated, is done. Watkins believes in amputation in occasional cases of excessive elongation of the cervix only, because it endangers labor and stenosis. Plastic Operations upon the Broad Ligaments: Plastic operations on the broad ligaments are a valuable adjunct to the operation, if the uterus is much prolapsed, much increased in size, or if the anterior vaginal wall is much shortened. Vaginal Fixation of the Round Ligaments: The technic is much the same as that formerly employed in the treatment of retropositions of the uterus. It is especially valuable when the prolapse is complicated by

backward displacement of the uterus. It is also of great value in cases of extensive prolapse of the uterus. It adds materially to our ability to cure some of the very bad cases without subjecting them to operations to produce sterility. The round ligaments are not long enough for vaginal fixation without undue tension, except when the uterus is retrodisplaced or much prolapsed. The ligaments should be firmly fixed to the submucous connective tissue by interrupted, buried, fine linen or silk suture at a place in the vaginal wall that will restore and fix the urethrocele, which is almost invariably present, to its normal location. The point of fixation will be further considered later. Advancement of the Anterior Vaginal Wall upon the Uterus: This consists in changing the place of attachment of the vaginal wall to the uterus to a plane higher on the uterus than formerly occupied, as devised by Goffe. The more the vaginal wall is advanced upon the uterus the more certain must be the cure of the bladder and uterine displacements, but because of the possible complication of pregnancy and labor it is not safe to attach the vagina much higher than the anterior reflexion of the peritoneum. Excision of the Vaginal Flaps: Redundant tissue should be excised to an extent consistent with minimum tension upon sutures. The hypertrophied mucosa (skin-like tissue) which is generally present over the base of the urethra should be excised, otherwise it is liable to protrude later. Sutures: Interrupted, buried, fine linen or silk sutures are advocated for the broad ligament, for suture of loops of the round ligaments, and in exceptional cases two or three such sutures may be needed in the connective tissue; otherwise interrupted or continuous Claudius catgut should be used entirely. The part of the wound caused by excision of the hypertrophied mucosa over the base of the urethra should be closed first. The placing of the first "circular" suture is highly important, as it determines the places the urethra will be left in, it closes all or most of the hernial opening of the cystocele, and it should ensure an anterior position of the uterus. It should include the vaginal wall, so that when tied it will restore the urethra to its normal location, which is one of relative fixation. The suture should pass through the anterior surface of the uterus at a place above its point of pivotal action when tipped forward or backward, so that when tied it keeps the body anteriorly. When tied care should be taken not to include a knuckle of the bladder. Succeeding sutures should parallel this one at short distances until the wound is closed.

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF

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Inquiry into the Presence of Diphtheria and Diphtheroid Organisms in Open Wounds.—In September, 1917, a report was published by Fitzgerald and Robertson upon the presence of the diphtheria

bacillus in the wounds of returned soldiers. These observations were made in Canada upon soldiers returned from the hospitals in England. The authors found no less than 40 out of 67 cases yielded cultures of B. diphtheriæ. These rather startling findings led to an investigation by ADAMI, BOWMAN and others (*Canadian Med. Assn., Jour.*, 1918, viii, 769) of wounds in the hospitals in England. These authors made a thorough investigation of possible carriers among the patients and hospital personnel. Cultures were made from wounds with a particular attempt of isolating members of the diphtheria and diphtheroid groups. Organisms showing characteristic morphology were tested on differential media and such organisms presenting cultural characteristics of B. diphtheriæ were tested for pathogenicity upon guinea-pigs. Of this study 306 cases were examined. Of these 56 showed the presence of diphtheroid organisms while 2 contained bacteria yielding all the characteristics of the B. diphtheriæ. Two other organisms which showed morphological and cultural characteristics of the bacillus of diphtheria were found to have no pathogenic qualities when tested upon animals. The authors conclude that diphtheroid organisms resembling B. diphtheriæ are present in a certain percentage of wounds. These organisms must be distinguished from the toxin producing bacteria by animal experiment. They indicate that the cultural responses upon the sugar media are in themselves not sufficiently indicative of the true nature of the B. diphtheriæ. The authors are not able to substantiate the claims of Fitzgerald and Robertson on the high incidence of B. diphtheriæ in the wounds. Diphtheroid organisms, on the other hand, were found in almost 20 per cent. of the cases.

Bacteriological Examination for Meningococcus Carriers.—A recent examination of all students and officers in the Kansas State Agricultural College to determine carriers of the meningococcus has led to a description of the technic employed with special emphasis on certain points. BUSHNELL (*Jour. Med. Res.*, 1918, xxxviii, 1) reports excellent results obtained by careful handling of technical methods already in use in most laboratories. By a laboratory force of seven workers, 500 examinations were made daily. Swabs were plated immediately, on a medium consisting of 2 per cent. meat infusion agar to which had been added 1 per cent. peptone, 0.5 per cent. glucose and 5 per cent. defibrinated sheeps' blood. These were incubated for twenty-four to forty hours and colonies examined by a slightly modified Gram stain. The author emphasizes the importance of planting cultures immediately to ensure a rapid and abundant growth of the meningococcus. Plates were warmed before using. Another point he emphasizes is the streaking of each swab toward the center of the plate by means of a platinum wire, as the growth of the meningococcus is easily prevented by many other types of microörganisms. The West tube was found to be of little value for this work. It is not only expensive and difficult to make, but it is useless to anyone experienced in taking swabbings from the nasopharynx. There is greater tendency to gag the patient by the use of the tube, and frequently a great deal of mucus obtained in the swabbing is removed on the inside of the tube when the swab is drawn out. Much more accurate results were obtained by rapid implantation on

fresh warm plates. By these improved methods of technic it was found that 2.52 per cent. of the normal population of the community were meningococcus carriers, many of whom were workmen or soldiers from Camp Funston. None of them developed the disease and all were eventually made free from the carrier state.

Influence of Parathyroidectomy on the Gastro-intestinal Mucosa of Dogs and Rabbits.—In an earlier series of experiments the author, FRIEDMAN (*Jour. Med. Res.*, 1918, xxxviii, 69) observed the development of intestinal lesions following partial removal of the thyroid. Similar observations have been recorded by Carlson and Jacobson. In the present study the author repeated his experiments in removing a portion of the thyroid from ten rabbits and ten dogs. In addition to this the complete extirpation of the thyroid was performed upon other animals. The author claims that in performing these operations one or more of the parathyroids were left in the majority of animals. The animals were killed from four to one hundred and twenty-four days after operation. At autopsy observations were made respecting the size of the hypophysis, adrenals and remaining lobe of the thyroid. In the gastro-intestinal canal erosions and ulcers were found in the stomach, duodenum and occasionally in the appendix. Gastric or duodenal lesions were found in eleven out of fourteen dogs while the appendix was involved only twice. A very similar percentage was obtained in the rabbits. In his discussion the author associates the gastro-intestinal lesions with the operative procedure, the exact nature of which is difficult to interpret from the author's own description. The nature of the lesions in the gastro-intestinal tract is not described, and although he states that "the picture did not correspond to chronic peptic ulcer in man," he draws conclusions suggesting their identity. The analysis of the experimental work is far from conclusive, particularly in indicating the influence of derangements of the thyroid or parathyroid upon the tissues of the gastro-intestinal canal.

Researches of Cancerous Diseases in Norway.—GADE (*Jour. Cancer Res.*, 1918, iii, 107) had at his disposal for study of cancer in Norway the statistics compiled by the Norway Committee for Cancer Research for the years 1908–1912 and the Official Mortality Reports during the years 1902–1911. From these latter a survey of geographical distribution and general frequency of malignant tumors was obtained. While a marked continuous rise in the number of deaths each year from cancer occurs there are several factors which considerably diminish the apparent increase. Thus when the corresponding growth in the population and better diagnosis of the disease have been taken into consideration the real increase does not exceed the ratio of 1 to 1.6. The death-rate of 10.6 per 10,000 (cancer figure) is estimated to be fairly evenly distributed between city and urban population. However, wide variations in the number of cancer deaths exist in different districts, and especially conspicuous is the high rate found in certain densely populated localities. An attempt was made to determine whether a parallelism existed between percentage of cancer deaths and that of aged persons in certain districts (age figure), but although a certain coincidence between low or high age and cancer figures could be noted no

ruling law could be definitely demonstrated. It was noted that in many small towns on the south coast where old sailors resided the cancer mortality was exceedingly high. The relation of cancer to age is similar to that generally found, namely, a gradual increase in frequency through every decennium and reaching an absolute maximum between sixty and seventy years. The figures are very equally distributed between the sexes, when all ages are taken into account, though above thirty-five years a preponderance occurs among males. The most noteworthy feature regarding location in organs is the predominance of gastric carcinoma, which represents 61.2 per cent. of the whole number, with a greater prevalence of the disease in the male sex. The material collected by the Norwegian Cancer Committee is dependent upon voluntary contributions from practitioners, and consists of only 4219 cases. Comparison of this material with the official mortality statistics reveal one striking feature which they possess in common, namely, the predominance of cancer of the stomach. Conspicuous among these cases is also the preponderance of malignant tumors in advanced age. More than one-half the cases reported occur between fifty and seventy years. In 2554 cases a study regarding the distribution of cancer according to occupation was made. Although this number is comparatively small it is interesting to note that the high number (1034) of cases occur in farmers and over 800 cases in factory employees and skilled laborers. Of the cases reported 2706 give information regarding heredity, concerning which the author concludes there is no data to support the supposition of direct transfer from one individual to another. Thus in 304 families, numbering 677 patients, the identical localization occurs in parent and offspring, though in the majority of cases the stomach is the site involved. This, however, may be merely a coincidence, since in 417 families embracing 883 cancerous individuals the localizations were most varying. The author suggests "that some of the cases reported point to a direction of family disposition, possibly in the shape of an inherited tendency toward fatal dislocations in the sense of Cohnheim."

Fluctuations in the Growth Energy of Malignant Tumors in Man with Special Reference to Spontaneous Recession.—Among investigators of transplanted tumors in animals it is a well-recognized fact that retrogressions not infrequently occur. Clinicians have also reported instances of similar recessions of tumor in man, and it has even been estimated that complete retrogressions occur once in every 100,000 cases. These retrogressive changes may vary from a temporary standstill to complete disappearance of the growth; they may be of epithelial or connective-tissue origin and widely distributed in the body, and they may occur at any age or in either sex. Thus far it has not been possible to determine any one specific factor responsible for these variations. Indeed, they apparently are accompanied by the most diverse physiological conditions. With a view to an analysis of this phenomenon of recession in tumor growth from the standpoint of our present knowledge of experimental cancer ROHDENBURG (*Jour. Cancer Res.*, 1918, iii, 193) has gathered from the literature 302 cases of marked recessions or spontaneous cures, which he has divided into three groups, depending upon the efficiency of the diagnosis. Group I consists of those reports

which stand a most rigid scrutiny; group II contains those cases in which some slight question might be raised regarding adequate control of possible diagnostic errors; group III comprises those cases open to more or less grave doubt as to diagnosis. Each group is again subdivided into complete and partial retrogressions. The growths vary widely in type, but malignant epithelial tumors are present in the largest number. The causes of retrogression reported are varied, incomplete operation and heat being about evenly divided. In many cases rise of temperature immediately follows the operation for removal of the mass. The heat may be applied externally or it may be due to an infection such as erysipelas, tuberculosis or pneumonia. A continuous temperature of 104° to 105° for several days is most effective. Less frequently some profound change in the metabolic processes of the individual, *e. g.*, cachexia or puerperium, is assigned as the cause of the retrogression. In a number of cases simple exploratory laparotomy was sufficient to cause retrogressions, which occasionally resulted in a complete disappearance of the tumor. Why such a procedure should effect a cure remains at present quite inexplicable.

Examination of Blood Preliminary to the Operation of Blood Transfusion.—Although there has been a gradual improvement in the technic of the methods used for testing the incompatibility of bloods previous to transfusion even the more recent tests require the withdrawal of a considerable quantity of blood from both patient and donor. The method outlined by Coca (*Jour. Immunol.*, 1918, iii, 93) permits the mutual tests to be made with practically a drop of blood from each individual. Further, only a few glass slides and a blood-mixing pipette, such as is used in making a leukocyte count, is necessary. By the use of the stem of the pipette, which is graduated into ten divisions, a dilution of the blood of both donor and patient can readily be made in the proportions of 9 parts of blood to 1 part of diluent. In order to prevent clotting the pipette is previously rinsed with 10 per cent. sodium citrate, of which a sufficient amount is left in the pipette to fill the lowest division. Blood is then sucked up to the point on the stem marked 1. The two samples of citrated blood are blown out upon glass slides, and from these preliminary dilutions second mixtures of blood in the proportions of 1 to 10 can be made with normal saline by adding to 9 parts of the saline 1 part of the citrated blood. These two procedures give 10 to 1 and 1 to 10 dilutions of both donor and patient's blood, from which the combination requisite for testing for agglutination can be readily made. Thus, three divisions each of citrate blood of donor and patient and three divisions of citrate blood of donor to three divisions of saline blood mixture of patient, and *vice versa*. These are examined microscopically for clumping of corpuscles. In actual practice it is not necessary to make the 1 to 10 dilution of the patient's blood in saline because the corpuscular content of the patient's blood is reduced sufficiently to meet the purpose of dilution. If more than one donor is to be tested the slides must be duplicated or triplicated according to the number of perspective donors. When it is desired to perform the indirect test in which both bloods are examined to ascertain in which one of the four agglutinin groups they belong a similar technic is employed, except that each blood is tested against sera, known to belong to group I and II, for evidence of agglutination.

Studies on the Antitrypsin of Serum.—In this work FUGIMOTO (*Jour. Immunol.*, 1918, iii, 51) deals with three aspects of antitryptic activity, namely, its inactivation, the part of the serum in which it is found and the nature of the reaction. His experiments were made throughout with the Bergman method, which he modified by reducing the original concentrations of the reagents. To given amounts of casein are added varying quantities of blood serum and the inactivation is indicated by absence of any precipitation on the addition of acetic acid to the mixture. Serum was employed in the concentration of 1 per cent. to avoid heat coagulation of the serum *per se*. The conclusions reached from his experiments on the effect of heat on antitrypsin confirm in general those of the earlier investigators, namely, that the antitrypsin is thermolabile and that the point of inactivation varies slightly in various sera. Heating rabbit and sheep sera for ten minutes at 75° C. causes a complete inactivation, while a temperature of 65° C. for the same time suffices when horse serum is tested. In no case was the author able to obtain any diminution of the antitryptic properties of the serum by shaking. In order to test in what part of the blood the antitrypsin is found, serum was fractioned by several methods in globulin and albumin and the antitryptic activity of each fraction noted. It was demonstrated that the antitryptic action occurs in both fractions, but in a less degree in the albumin, as was previously stated by Döblin and Kammerer. It was further demonstrated that the antitrypsin is not lost from either the globulin or albumin by dialysis and that the ether extract of serum does not contain antitrypsin. An interesting observation deals with the possible identity of antitrypsin and serum albumin. Purified crystallized serum albumin was shown to exert an antitryptic action, but whether the serum albumin alone is responsible for this activity was not demonstrated.

HYGIENE AND PUBLIC HEALTH

UNDER THE CHARGE OF

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Germicidal Action of Freezing Temperatures upon Bacteria.—HILLARD and DAVIS (*Jour. Bacteriol.*, July, 1918) state that intermittent freezing of bacteria exerts a more effective germicidal action than continuous freezing. The reduction is much less in milk and cream than in pure tap water when freezing temperatures are applied, due, no doubt, to physical protection offered to the bacteria by the colloidal and solid matter in suspension. The degree of cold below freezing is not a very important factor in the destruction of bacteria. There is no critical

temperature below freezing when the germicidal effect is greatly accelerated. The death-rate of B. coli is much higher in media which are frozen solid than it is in the same media not solid and at a slightly lower temperature. Crystallization, probably resulting in mechanical crushing, is an important germicidal factor in causing the death of bacteria at zero degrees Centigrade and below. The greatest reduction occurs promptly upon freezing and refreezing, but is not caused so much by the sudden change in temperature as by this mechanical factor.

Scabies in Military and Civil Life.—KNOWLES (*Jour. Am. Med. Assn.*, November 16, 1918) states that scabies should be treated by the routine suggested by the leading dermatologists of Great Britain, France and the United States, which is as follows: On the first day the patient is given a warm bath with plenty of soap. One rubbing is given with sulphur (precipitated sulphur, 1 dram to the ounce of petrolatum). On each of the next three days a sulphur rubbing is given. On the fifth day a warm bath, with plenty of soap, and clean clothes are given. Thorough and minute examination of the entire body is made to ensure that no active disease remains. If active lesions are still present four more days of sulphur rubbings are given, followed by another warm bath, another careful examination of the skin surface and clean clothes. The disease is a greater problem in military than civil life, because of its greater frequency and severity. It is rather atypical in military life because of the comparative freedom of the hands and more marked involvement of the penis. Complications secondary to scabies are much more frequent and markedly more severe in military than in civil practice. A rather prolonged convalescence is observed in approximately 10 per cent. of scabies in military practice.

New Pathology of Syphilis.—WARTHIN (*Am. Jour. Syphilis*, July, 1918, No. 3, ii) states that the gumma is not the essential typical lesion of old or latent syphilis. It is a relatively rare formation, and the great majority of cases of syphilis run their course without the formation of gummatous granulomata. The new pathology of syphilis is based upon the demonstration that the essential tissue lesion of either late or latent syphilis is an irritative or inflammatory process, usually mild in degree, characterized by lymphocytic and plasma-cell infiltrations in the stroma, particularly about the bloodvessels and lymphatics, slight tissue proliferations, eventually fibriosis and atrophy or degeneration of the parenchyma. These mild inflammatory reactions are due to the localization in the tissues of relatively avirulent spirochetes. Syphilitic inflammations of this type occur in all tissues and organs, but are most easily recognized in the nervous system, heart, aorta, pancreas, adrenals and testes. They are, however, usually widely distributed throughout the entire body, although in individual cases showing special predilection for certain organs or tissues. No explanation of these system, organ or tissue predilections is yet evident; neither is there any explanation of those cases in which all organs and tissues show the most severe degree of these lesions. The syphilitic is a spirochete carrier. In this respect the Spirocheta pallida is to be classed with the trypanosome, the malarial organisms, lepra and tubercle bacilli, streptococcus, etc. Syphilis tends to become a mild process,

but at any time the partnership between the body and the spirochete may become disturbed and tissue susceptibility or virulence of the spirochete become increased so that the disease again appears above the clinical horizon. Immunity in syphilis depends upon the carrying of the spirochete. A price is paid for this immunity in the form of the defensive inflammatory lesions previously described. The disastrous effects of syphilitic infection usually require a period of years for their development. The slowly progressive lesions, fibriosis and atrophy, may at last manifest themselves in paresis, tabes, myocarditis, aortitis, aneurysm, diabetes, hepatitis or in many other forms of tissue damage and functional disturbance. Lesions of the viscera are much more common and important clinically than those of the central nervous system, but they are rarely recognized as syphilitic by the clinician. Syphilitic death occurs most frequently in males between the ages of forty and sixty. Chronic myocarditis is the most common form of death due to syphilis. The pathological diagnosis of syphilis is essentially microscopic. Only in a relatively small number of cases are the gross lesions (tabes, gumma, aortitis, etc.) typical enough to be recognized by the naked eye. A negative diagnosis of syphilis cannot be given with any certainty without a routine microscopic examination of all organs and tissues, but particularly of the left ventricle wall, the aorta, both its arch and abdominal portion, the testes, pancreas and adrenals.

Tuberculosis and Syphilis.—ADELUNG (*Jour. Am. Med. Assn.*, April 27, 1918, No. 17, lxx, 1211) states that in order to impress the importance of the use of the Wassermann test in tuberculosis patients the cases in the Alameda County Tuberculosis Clinic during the past four years were studied. The Wassermann tests were made at the State Hygienic Laboratory in Berkeley. In all cases the sputum examinations confirmed the diagnosis of tuberculosis. Four years are included, 1914 to 1917, during which 195 cases received Wassermann tests. Summing them up for the four years, in 17, or 8.7 per cent., the reaction was positive. This represents what would have been overlooked by the average practitioner when treating open cases of tuberculosis of the lungs without making the Wassermann test.

Toxic Jaundice Due to Dinitrophenol.—WARTHIN (*Int. Assn. of Med. Museums*, Bulletin No. vii, May, 1918) states that poisoning by dinitrophenol is not mentioned by either Thompson or Oliver. Dr. Alice Hamilton, likewise, does not mention it in the Government Bulletin of occupational poisoning in munition workers. Warthin found from his observations, however, that it is capable of producing acute yellow atrophy and toxic jaundice, and states that it must be added to the list of dangerous occupational hepatotoxic poisons. At this time it is, therefore, increasingly important that suitable protection be provided for workers with this product in munitions manufacture.

Trench Fever.—The Medical Research Committee of the American Red Cross (Report of Commission, 1918), consisting of Major Richard P. Strong, Major Homer F. Swift, Major Eugene L. Opie, Captain Ward J. MacNeal, Captain Walter Baetjer, Captain A. M. Pappenheimer, Captain A D. Peacock and Lieutenant David Rapport, studied

the method of transmission of trench fever and reached the following conclusions: (1) That trench fever is a specific infectious disease; that it is not a modified form of typhoid or paratyphoid fever and is not related, from an etiological standpoint, to these diseases. (2) That the organism causing the disease is a resistant filterable virus. (3) That the virus causing trench fever is present particularly in the plasma of the blood of trench fever cases and that such plasma will produce the disease on inoculation into healthy individuals. (4) That the disease is transmitted naturally by the louse Pediculus humanus, Linn., var. corporis, and that this is the important and common means of transmission. That the louse may transmit the disease by its bite alone, the usual manner of infection, or the disease may be produced artificially by scarifying the skin and rubbing in a small amount of the infected louse excrement. (5) That a man may be entirely free from lice at the time he develops trench fever, the louse that infected him having left him some time previously as its host, and that the louse need only remain upon the individual for a short period of time in order to infect him. (6) That the virus of trench fever is also sometimes present in the urine of trench fever cases and occasionally in the sputum, and that the disease may be produced in man by the introduction of the virus in the urine or sputum through the scarified or otherwise abraded skin. (7) That since the urine and sometimes the sputum of trench fever patients are infective, these should be sterilized in order to avoid the possibility of accidental infection from them. (8) That in order to prevent trench fever or limit its spread, and thus save man-power for the armies, greater efforts must be made to keep soldiers in general from infestation with lice. The authors state that exceedingly great care should be taken to completely disinfect all patients as soon as practicable, and particularly upon their entering the hospital. Patients on entrance should be carefully bathed and subsequently sponged with alcohol. Their clothing and blankets should be removed, and, whether or not lice or ova are found upon them, should be carefully sterilized by moist heat at a temperature not below 70° C. for half an hour, since it is possible for the virus to be still present on the clothing. It should be borne in mind that a man with trench fever may be entirely free from lice at the time that he develops symptoms of the disease. Trench fever patients should at all times be carefully protected from louse infestation, and inspection of them for lice should be made daily. They should be treated in separate wards. As the urine contains the virus and is infective it should be sterilized during the active stages of the disease. Sputum cups should be provided for the patient and any expectorated sputum and saliva from them sterilized. Officers should regard the systematic destruction of lice as one of the most urgent of their duties, and should exercise every effort to prevent louse infestation among soldiers and to see that any of them infested with lice are promptly disinfected and their clothing sterilized. The above precautions are of the utmost importance in order to prevent the further spread of trench fever among troops.

Observations on the Presence of the Meningococcus in the Blood.—Maxcy (*Jour. Infect. Dis.*, November, 1918) made studies upon the epidemiology of epidemic meningitis at Camp Beauregard. He states

that twenty-seven blood cultures done on patients suspected of being cases of abortive meningococcus infection were negative. The abortive meningococcus infection was not a considerable factor in the epidemiology of the disease during the epidemic in February, 1918. The author reports a case of meningococcus infection in which the blood-stream invasion was transient and the organism quickly localized in the meninges, where it yielded to the intraspinal injection of serum; and a case of meningococcus septicemia with transient meningeal involvement, with recovery only after the injection of large amounts of antimeningococcus serum intravenously.

Acute Respiratory Diseases among Troops with Special Reference to Empyema.—BEALS, ZIMMERMAN and MARLOW (*Jour. Infect. Dis.*, November, 1918) in their study of acute respiratory diseases among troops detailed the incidence of various respiratory conditions, measles and rubella in their relation to each other and to the more serious conditions, pneumonia and empyema. They state that respiratory infections in 1917 and 1918 occurred among troops in waves, the greatest severity of the diseases being at the height of each wave. Not only were pneumonia and empyema more frequent and severe, but also tonsillitis, pharyngitis and bronchitis. The control of such epidemics would appear to depend on the sanitation in barracks as regards ventilation; adequate space and proper separation, especially of those even slightly affected with respiratory disease; on line officers not allowing overheated men to stand inactive in cold winds; on not indiscriminately giving triple typhoid inoculations at the very entrance of the soldier to camp without regard to any respiratory infection he might have at the time; on careful attention to overexertion and exposure of soldiers having mild respiratory disease and on close attention to the details of equipment to ensure adequate clothing for the unacclimated raw recruit on his arrival.

Survival of Typhoid Bacilli in Sour Milk.—MARSH (*Am. Jour. Public Health*, August, 1918, p. 590) states that typhoid and paratyphoid bacilli disappear from souring milk with an acidity represented by about 4 c.c. of $\frac{N}{10}$ NaOH. The dysentery bacilli are more sensitive, disappearing one day earlier than the others. The tests indicate that B. typhosus is sensitive to acidity and is usually destroyed in milk in a short time at about the degree of acidity occurring in fresh buttermilk as obtained in the New York market. Buttermilk would seem to be free of danger as a means of distributing B. typhosus or B. dysenteriæ in the ordinary course of events.

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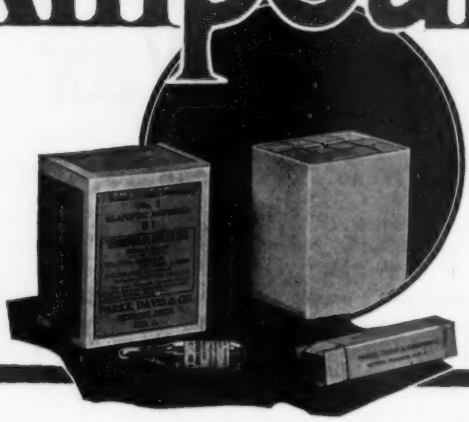

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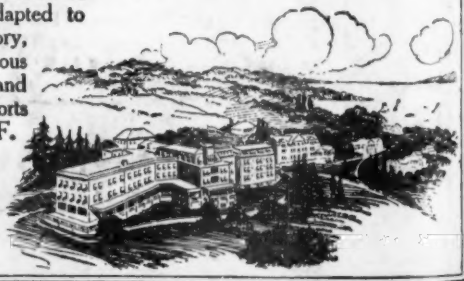

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